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ADDITIONAL NOTES ON THE ERIOCAULACEAE. LXXXVI

Harold N. Moldenke

ERIOCAULON GILWENSE Van Royen

Additional bibliography: Mold., *Phytologia* 53: 295. 1983.

Croft and his associates describe the leaves of this plant as "semi-glossy mid-green" and the "flowers" white.

Citations: NEW GUINEA: Papua: Croft & al. LAE.60807 (E--2426775). MOUNTED ILLUSTRATIONS: Van Royen, *Alpine Fl. N. Guin.* 2: 837, fig. 284 A--G. 1979 (Ld).

ERIOCAULON GLABERRIMUM Miyabe & Satake

Additional bibliography: Mold., *Phytologia* 24: 461. 1972; Mold., *Phytol. Mem.* 2: 300 & 599. 1980.

ERIOCAULON GLAUDESCENS W. Griff.

Additional bibliography: Mold., *Phytologia* 24: 461. 1972; Mold., *Phytol. Mem.* 2: 368 & 599. 1980.

ERIOCAULON GLAUCUM W. Griff.

Additional bibliography: Mold., *Phytologia* 32: 493. 1976; Mold., *Phytol. Mem.* 2: 272 & 599. 1980.

ERIOCAULON GLAZIOVII Ruhl.

Additional bibliography: Mold., *Phytologia* 32: 493. 1976; Mold., *Phytol. Mem.* 2: 141 & 599. 1980.

Additional citations: BRAZIL: Minas Gerais: Glaziov s.n. [Macbride photos 10558] (W--photo of type).

ERIOCAULON GOMPHRENOIDES Kunth

Additional bibliography: Ruhl. in Wettstein, *Denkschr. K. Akad. Wiss. Wien Math.-nat.* 79: 87. 1908; Mold., *Phytologia* 36: 478--479 & 482. 1977; Mold., *Phytol. Mem.* 2: 141 & 599. 1980.

Recent collectors have encountered this plant among Sphagnum in marshes, flowering and fruiting in September.

Additional citations: BRAZIL: Paraná: Lindeman & Irgang ICN. 8116 (Ld).

ERIOCAULON GRAPHITINUM F. Muell. & Tate

Additional bibliography: Mold., *Phytologia* 36: 479. 1977; Mold., *Phytol. Mem.* 2: 336 & 599. 1980.

ERIOCAULON GREGATUM Körn.

Additional bibliography: Fyson, *Indian Sp. Erioc. pl.* 5. 1923; Worsdell, *Ind. Lond. Suppl.* 1: 375. 1941; Mold., *Phytologia* 36: 479. 1977; Mold., *Phytol. Mem.* 2: 261, 278, & 599. 1980.

Additional illustrations: Fyson, *Indian Sp. Erioc. pl.* 5. 1923.

ERIOCAULON GRISEUM Körn.

Additional bibliography: Lotsy, Vortr. Bot. Stammesges. 3 (1): 706 & 964, fig. 480 (9) & (10). 1911; Mold., Phytologia 41: 421. 1979; Mold., Phytol. Mem. 2: 141 & 599. 1980.

Additional illustrations: Lotsy, Vortr. Bot. Stammesges. 3 (1): 706, fig. 480 (9) & (10). 1911.

ERIOCAULON GUADALAJARENSE Ruhl.

Additional bibliography: Mold., Phytologia 32: 493. 1976; Mold., Phytol. Mem. 2: 62 & 599. 1980.

McVaugh describes this plant as having very soft herbage and found it growing along rivulets in pine forests in an area of pine-oak forest on decomposed granitic soils on steep mountainsides associated with *Podocarpus*, *Quercus*, and other deciduous trees in the rocky stream valleys, at 850--1160 m. altitude, in flower in February.

Additional citations: MEXICO: Jalisco: McVaugh 26364 (Mi); Pringle 1734 (Mi--isotype).

ERIOCAULON GUYANENSE Körn.

Additional bibliography: Mold., Phytologia 32: 493--494 (1976), 35: 341 (1977), and 37: 87 & 257. 1977; Mold., Phytol. Mem. 2: 115, 121, 126, 141, & 599. 1980.

ERIOCAULON HAMILTONIANUM Mart.

Additional bibliography: Fyson, Indian Sp. Erioc. pl. 33. 1923; Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Mold., Phytologia 32: 494 & 495. 1976; Babu, Herb. Fl. Dehra Dun 547--548. 1977; Mold., Phytol. Mem. 2: 261, 285, 401, & 599. 1980; Mold., Phytologia 50: 251 (1982) and 53: 295. 1983.

Additional illustrations: Fyson, Indian Sp. Erioc. pl. 33. 1923.

Saldanha refers to this plant as a common herb with white heads in Mysore and found it there in moist shaded areas by streams, in flower in October.

Material of this species has been misidentified and distributed in some herbaria as *E. elenorae* Fyson.

Additional citations: INDIA: Karnataka: Saldanha 15416 (Ld, W--2616731).

ERIOCAULON HAMILTONIANUM var. *MINIMUM* Fyson

Additional bibliography: Mold., Phytologia 29: 199. 1974; Mold., Phytol. Mem. 2: 261 & 599. 1980.

ERIOCAULON HAMILTONIANUM var. *MINOR* Fyson

Additional bibliography: Mold., Phytologia 29: 199. 1974; Mold., Phytol. Mem. 2: 261 & 599. 1980.

ERIOCAULON HANANOEGOENSE Masamune

Additional bibliography: Mold., Phytologia 32: 494. 1976; Mold., Phytol. Mem. 2: 303 & 599. 1980.

ERIOCAULON HAYATANUM T. Koyama

Additional bibliography: Mold., Phytologia 24: 462. 1972; Mold., Phytol. Mem. 2: 292 & 599. 1980.

ERIOCAULON HELEOCHARIOIDES Satake

Additional bibliography: Mold., Phytologia 32: 494. 1976; Mold., Phytol. Mem. 2: 300 & 599. 1980.

ERIOCAULON HENRYANUM Ruhl.

Additional bibliography: Mold., Phytologia 34: 264 & 400. 1976; Mold., Phytol. Mem. 2: 261, 278, 285, 292, & 600. 1980.

Lecomte (1912) cites for this species only an unnumbered André collection from Annam, Vietnam.

Recent collectors have encountered this plant on mountaintops, in light, wet, sandy dipterocarp forests, in wet places on moist savannas over sandstone, in bogs and open marshy meadows, in swampy ground, and in boggy areas along streams, at 210--3000 m. altitude, in flower in June, July, and October to December, in fruit in July and November. They describe the plant as 3--12 inches tall, the "flowers" white, gray, grayish-white, or greenish-white. Rock even found it growing at 12,000 feet altitude.

Additional citations: CHINA: Yünnan: Forrest 4897 (Ba), 6182 (Ba), 8450 (Ba), 27861 (Ba); McLaren's Collectors V.34a (Mi, Mi); Rock 24927 (It). THAILAND: Beusekom, Geesink, & Wongwan 4589 (E--2359052); Beusekom & Smitinand 2141 (Ac); Phengkklai, Tamura, Niyomdham, & Sangkachand 4163 (N); Shimizu, Toyokuni, Koyama, Yahara, & Niyomdham T.21888 (Ac).

ERIOCAULON HENRYANUM f. VIVIPARUM Mold.

Additional bibliography: Mold., Phytologia 34: 264 & 400. 1976; Mold., Phytol. Mem. 2: 278 & 600. 1980.

ERIOCAULON HERZOGII Mold.

Additional bibliography: Mold., Phytologia 32: 494. 1976; Mold., Phytol. Mem. 2: 141 & 600. 1980.

ERIOCAULON xHESSII Mold.

Additional bibliography: Mold., Phytologia 24: 463. 1972; Mold., Phytol. Mem. 2: 233, 400, & 600. 1980.

ERIOCAULON HETEROCHITON Körn.

Additional bibliography: Mold., Phytologia 34: 400 (1976) and 41: 423, 452, & 453. 1979; Mold., Phytol. Mem. 2: 250 & 600. 1980.

ERIOCAULON HETEROCHITON var. ACUMINATUM Mold.

Additional bibliography: Mold., Phytologia 24: 463. 1972; Mold., Phytol. Mem. 2: 250 & 600. 1980.

ERIOCAULON HETERODOXUM Mold.

Additional bibliography: Mold., Phytologia 32: 494. 1976; Mold., Phytol. Mem. 2: 121 & 600. 1980.

Additional citations: GUYANA: Sandwith 1603 (W--1931205).

ERIOCAULON HETEROGYNUM F. Muell.

Additional bibliography: T. B. Muir, *Muelleria* 2: 140. 1972; Mold., *Phytologia* 34: 400. 1976; Mold., *Phytol. Mem.* 2: 326, 336, & 600. 1980.

ERIOCAULON HETEROLEPIS Steud.

Additional bibliography: Mold., *Phytologia* 32: 494--495 (1976), 33: 11 (1976), and 36: 38. 1977; Mold., *Phytol. Mem.* 2: 261, 314, & 600. 1980.

Ramamoorthy describes this plant as a fairly common herb in Mysore, growing in the open near streams in the wet deciduous zone, commenting that the involucrel bracts are lanceolate and longer than the floral bracts. He found the plant in flower and fruit in October.

The Ramamoorthy HFP.1368, distributed as E. heterolepis, seems actually to be E. sollyanum Royle.

Additional citations: INDIA: Karnataka: Jarrett, Saldanha, & Ramamoorthy HFP.1108 (W--2797016).

ERIOCAULON HETEROLEPIS var. NIGRICANS Körn.

Additional bibliography: Mold., *Phytologia* 36: 479. 1977; Mold., *Phytol. Mem.* 2: 314 & 600. 1980.

ERIOCAULON HETEROMALLUM Bong.

Additional bibliography: Mold., *Phytologia* 24: 463. 1972; Mold., *Phytol. Mem.* 2: 141 & 600. 1980.

ERIOCAULON HETEROPEPLON Alv. Silv.

Additional bibliography: Worsdell, *Ind. Lond. Suppl.* 1: 375. 1941; Mold., *Phytologia* 32: 495. 1976; Giuliatti, *Bol. Bot. Univ. S. Paulo* 6: 39--47. 1978; Mold., *Phytol. Mem.* 2: 141 & 600. 1980; Mold., *Phytologia* 53: 265. 1983.

Giuliatti (1978) has reduced this taxon to synonymy under E. melanocephalum Kunth.

ERIOCAULON HETEROPETALUM Ruhl.

Additional bibliography: Mold., *Phytologia* 36: 479. 1977; Mold., *Phytol. Mem.* 2: 89 & 600. 1980.

ERIOCAULON HEUDELOTII N. E. Br.

Additional bibliography: Mold., *Phytologia* 41: 416 & 421. 1979; Mold., *Phytol. Mem.* 2: 200, 205, 233, 235, 242, 401, & 600. 1980; Mold., *Phytologia* 53: 265 & 267. 1983.

Recent collectors describe this plant as to 12 cm. tall, with black anthers, and have found it growing in wet moss by small rivulets, in both flower and fruit in March and April.

Material has been misidentified and distributed in some herbaria as E. abyssinicum Hochst., E. "amboense Schinz", and E. "amboensis Schinz".

Additional citations: NAMIBIA: Giess 10245 (Mu), 15280 (Mu); Wanntorp & Wanntorp 949 (Mu).

ERIOCAULON HILDEBRANDTII Körn.

Additional bibliography: Mold., *Phytologia* 29: 199. 1974; Mold., *Phytol. Mem.* 2: 250 & 600. 1980.

ERIOCAULON HOMETEPALUM T. Koyama

Additional bibliography: Mold., *Phytologia* 24: 464. 1972; Mold., *Phytol. Mem.* 2: 292 & 600. 1980.

ERIOCAULON HONDOENSE Satake

Additional bibliography: Mold., *Phytologia* 36: 479. 1977; Holm, Pancho, Herberger, & Plucknett, *Geogr. Atlas World Weeds* 148. 1979; Mold., *Phytol. Mem.* 2: 299--301, 303, & 600. 1980.

Additional citations: JAPAN: Honshu: Ohwi & Koyama 1124 (Mi); Togasi 914 (Mi), 1101 (Mi).

ERIOCAULON HONDOENSE var. GRACILE Satake

Additional bibliography: Mold., *Phytologia* 24: 464. 1972; Mold., *Phytol. Mem.* 2: 300 & 600. 1980.

ERIOCAULON HONDOENSE var. PILOSUM Satake

Additional bibliography: Mold., *Phytologia* 24: 464. 1972; Mold., *Phytol. Mem.* 2: 300 & 600. 1980.

ERIOCAULON HONDOENSE var. STELLATUM Satake

Additional bibliography: Mold., *Phytologia* 24: 464--465. 1972; Mold., *Phytol. Mem.* 2: 301 & 600. 1980.

ERIOCAULON HONDOENSE var. STENOPETALON T. Koyama

Additional bibliography: Mold., *Phytologia* 24: 465. 1972; Mold., *Phytol. Mem.* 2: 301 & 600. 1980.

ERIOCAULON HOOKERIANUM Stapf

Additional bibliography: Worsdell, *Ind. Lond. Suppl.* 1: 375. 1941; Mold., *Phytologia* 34: 401 & 402 (1976), 36: 479 (1977), and 41: 457. 1979; Mold., *Phytol. Mem.* 2: 261, 285, 292, 296, 314, 326, & 600. 1980.

Recent collectors describe this plant as a rosette herb, often growing in small dense cushions, the leaves yellowish-green or semi-glossy mid-green, the involucre "gray-blackish", and the inflorescence white or "gray-white". They report it common in wet blang, in dense or loose tussocks, and in swamps among evenly mixed sward of Cyperus, Eleocharis, and Xyris in 25 cm. of water, at 2000--3420 m. altitude, in flower in July and both in flower and fruit in March, April, and August.

Lecomte (1912) cites for this species only an unnumbered Balansa collection from Tonkin, Vietnam, but records it also from Borneo.

Additional citations: GREATER SUNDA ISLANDS: Sumatra: Wilde & Wilde-Duyfjes 15368 (W--2887972), 16273 (W--2888026). NEW GUINEA: Papua: Croft & al. LAE.61929 (E--2473571); Walker ANU.517 (W--2956515).

ERIOCAULON HOOKERIANUM var. MICROPHYLLUM Van Royen

Additional bibliography: Mold., Phytologia 24: 465. 1972; Mold., Phytol. Mem. 2: 326 & 600. 1980.

ERIOCAULON HOOPERAE Mold., sp. nov.

Herba parva foliis tenuissimis rigidulis adscendentibus 3--5 cm. longis usque ad 1 mm. latis pallide rubellis apicaliter longissime attenuatis basaliter distincte fenestratis utrinque glabris, pedunculis gracillimis in statu juvenile 1.5--3.5 cm. longis glabris, capitulis parvissimis, bracteis involucrentibus paucis pallide stramineis oblongis ca. 2 mm. longis 1 mm. latis externe glabris.

A small rosette herb, the numerous basal leaves very slender, pinkish, thin-textured and decidedly fenestrate (in the broader portions), 3--5 cm. long, to 1 mm. wide, apically very long=attenuate, glabrous on both surfaces, mostly erect or ascending, the inflorescences apparently quite immature, the peduncles filiform, glabrous, 1.5--3.5 cm. long, the heads apparently very few-flowered and small, involucrel bracts few, closely appressed, oblong, about 2 mm. long and 1 mm. wide, externally glabrous, the flowers too immature for accurate dissection or description.

The species is based on G. C. Taylor 92 growing in sand beside a waterhole 1.5 km. north of Kalumburu Mission in Western Australia, collected on May 30, 1971, and deposited in the Lundell Herbarium at the University of Texas. Miss Sheila S. Hooper, at Kew, kindly examined the type specimen and reported to me on June 11, 1977: "very young and I cannot make out the floral structure", noting that "The stiff pink-tinged leaves look distinctive but I cannot match it except in E. spectabile which appear [to be] a much larger plant. E. nanum has similar small heads with gray floral bracts." The species is dedicated to her. Based on material available to be, its visible characters are very dissimilar to those of both E. nanum R. Br. and E. spectabile F. Muell.

Citations: AUSTRALIA: Western Australia: G. C. Taylor 92 (Ld--type).

ERIOCAULON HUIANUM Ruhl.

Additional bibliography: Mold., Phytologia 34: 401. 1976; Mold., Phytol. Mem. 2: 278 & 600. 1980.

ERIOCAULON HUMBOLDTII Kunth

Additional synonymy: Eriocaulon humboldtii Kuhl ex Mold., Phytologia 50: 260, in syn. 1982.

Additional bibliography: Bong., Mem. Acad. Imp. Sci. St.-Petersb., ser. 6, 1: 630. 1831; Knuth, Feddes Repert. Spec. Nov. 43: [Init. Fl. Venez.] 179. 1927; Mold., Phytologia 41: 422. 1979; Mold., Phytol. Mem. 2: 108, 115, 121, 141, & 600. 1980; Mold., Phytologia 50: 260. 1982.

Recent collectors refer to the flowering inflorescences of this plant as "white" or "whitish". They have encountered the plant in brejo, on "treeless wet savannas leading to morichal",

"frequent in black sandy soil of high wet savannas", "in ponds in morichal", "in agapó de solo arenoso", in marshy grasslands, in marshy savannas leading to gallery forests, in cerrado, in acid bogs with Sphagnum, in artificially formed ponds, in wet depressions in savannas with many other ericauls and xyrids, and "in wet areas on savannas leading to cano", at 60--720 m. altitude, in flower from February to April and in August and November, in fruit in April and November. Murça Pires & Furtado aver that the flower stalks may attain a height of 1--1.5 meters, but I have never seen any remotely approaching such a length.

Material of E. humboldtii has been misidentified and distributed in some herbaria as Syngonanthus xeranthemoides (Bong.) Ruhl.

Additional citations: COLOMBIA: Vaupés: Schultes & Cabrera 20016 (W--2198934). VENEZUELA: Amazonas: Davidse & Huber 14997 (E--2719335, Ld); D. Huber 652 (Vø), 3477 (Lc), 3622 (Lc), 4715 (Ld); Huber & Tillett 2863 (Ld); Maguire, Cowan, & Wurdack 30464 (W--2046496); Maguire & Maguire 35473 (W--2168953); Maguire, Phelps, Hitchcock, & Budowski 31784 (W--2046548). Apure: Davidse & González 13909 (Ld), 14685 (Ld), 15868 (Ld), 15938 (Ld). Bolívar: Koyama & Agostini 7230 (W--2575509A); Liesner & González 11305 (Ld), 11422 (Ld); B. Maguire 33232 (W--2168903); Maguire & Wurdack 33997 (W--2168919), 35754 (W--2168959); Steyermark 75243 (W--2407748), 75272 (W--2407750), 88796 (W--2435331), 121085 (Ld); Steyermark & Wurdack 24 (W--2168499, W--2407787); Wurdack & Monachino 41173 (W--2223465). BRAZIL: Amapá: Austin, Nauman, Secco, Rosário, & Santos 7277 (Ld, N, W--2932766). Amazônas: Calderón, Monteiro, & Guedes 2742a (W--2951515); Murça Pires & Santos 16612 (N). Bahia: Hatschbach 42132 (Ld); Irwin, Grear, Souza & Santos 14742 (W--2801663), 44107 (Ld). Goias: Irwin, Maxwell, & Wasshausen 21355 (W--2598444). Mato Grosso: Maguire, Murça Pires, Maguire, & Silva 56270 (W--2514894); Murça Pires & Furtado 17137 (Ld); Prance, Lleras, & Coêlho 18839a (Ld, N); Silva & Pinheiro 4523 (N).

ERIOCAULON HUMILE Mold.

Additional bibliography: Mold., Phytologia 32: 494, 495, 501, & 506. 1976; Bola & Almeida, Journ. Bomb. Nat. Hist. Soc. 74: 226, 1977; Mold., Phytol. Mem. 2: 261 & 600. 1980.

Recent collectors refer to this plant as a fairly common herb in Mysore, with white flowering heads, and have found it growing in the open near streams in the wet deciduous zone, in both flower and fruit in October.

Material of this species has been identified and distributed in some herbaria as E. cinereum R. Br. and E. trilobum Hamilt.

Additional citations: INDIA: Karnataka: Jarrett & Ramamoorthy HFP.1107 (W--2797012). Maharashtra: Padhye 4 (Ld), 8 (Ld).

ERIOCAULON HYDROPHILUM Markötter

Additional bibliography: Mold., Phytologia 24: 466. 1972; Mold.,

Phytol. Mem. 2: 245 & 600. 1980.

ERIOCAULON INFAUSTUM N. E. Br.

Additional bibliography: Mold., Phytologia 29: 200 (1974) and 33: 15. 1976; Mold., Phytol. Mem. 2: 240 & 600. 1980.

ERIOCAULON INFIRMUM Steud.

Additional & amended bibliography: Walp., Ann. Bot. Syst. 5: 926 & 941--942. 1860; Fyson, Indian Sp. Erioc. pl. 19. 1923; Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Bennet, Fl. Howrah 98--100. 1976; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 148. 1979; Mold., Phytologia 41: 422. 1979; Mold., Phytol. Mem. 2: 261, 272, 285, 288, 290, 307, 314, 326, & 600. 1980.

Additional illustrations: Fyson, Journ. Indian Bot. 2: pl. 19. 1921; Fyson, Indian Sp. Erioc. pl. 19. 1923.

Lecomte (1912) cites for this species only unnumbered collections of Pierre and of Thorel from Cochinchina.

Bennet (1976) gives a good description of this species, giving its distribution in west Bengal as "rare" in "paddy-fields with a thin layer of water or moist fields without water; sometimes in other marshy areas", flowering there from November to January. Keenan and his associates found it growing mixed with sedges and other herbs in wet depressions in Tenasserim, where they report it "plentiful", 4--6 inches tall, with white inflorescences, at 800 feet altitude, flowering and fruiting in October.

The Padhye 4, distributed as this species, seems to be E. humile Mold. instead.

Additional citations: BURMA: Tenasserim: Keenan, Aung, & Rule 1646 in part (E--2620010).

ERIOCAULON INFIRMUM var. KURZII (Fyson) Mold.

Additional bibliography: Fyson, Indian Sp. Erioc. pl. 20. 1923; Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Mold., Phytologia 29: 200. 1974; Mold., Phytol. Mem. 2: 272 & 600. 1980.

Additional illustrations: Fyson, Indian Sp. Erioc. pl. 20. 1923.

ERIOCAULON INFIRMUM var. PUBERULENTUM (Mold.) Van Royen

Additional bibliography: Mold., Phytologia 41: 422. 1979; Mold., Phytol. Mem. 2: 307, 314, 326, & 600. 1980.

ERIOCAULON INSULARE Ruhl.

Additional bibliography: Mold., Phytologia 36: 480. 1977; Mold., Phytol. Mem. 2: 89, 91, & 600. 1980.

ERIOCAULON INTERMEDIUM Körn.

Additional bibliography: Fyson, Indian Sp. Erioc. pl. 2. 1923; Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Anon., Kew Bull. Gen. Ind. 111. 1959; Mold., Phytologia 29: 200--201, 226, & 227 (1974) and 33: 13. 1976; Giulietti, Bol. Bot. Univ. S. Paulo 6: 44. 1978; Mold., Phytol. Mem. 2: 261, 268, 285, 292, 314, & 600. 1980.

Additional illustrations: Fyson, Indian Sp. Erioc. pl. 2. 1923.
Lecomte (1912) cites for this species only an unnumbered Pierre collection from Cochinchina, Vietnam.

ERIOCAULON INTRUSUM Meikle

Additional bibliography: Mold., Phytologia 41: 422. 1979; Mold., Phytol. Mem. 2: 212, 402, & 600. 1980.

ERIOCAULON INUNDATUM Mold.

Additional bibliography: Mold., Phytologia 41: 422--423. 1979; Mold., Phytol. Mem. 2: 205, 222, & 600. 1980.

ERIOCAULON INYANGENSE Arwidsson

Additional & amended bibliography: Norlinth & Weimarck, Bot. Notiser 1934: 83 & 85. 1934; Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Mold., Phytologia 24: 467. 1972; Mold., Phytol. Mem. 2: 237 & 600. 1980.

Illustrations: Norlinth & Weimarck, Bot. Notiser 1934: 83 & 85. 1934.

ERIOCAULON IRREGULARE Meikle

Additional bibliography: Mold., Phytologia 41: 412 & 423. 1979; Mold., Phytol. Mem. 2: 207, 208, 401, & 600. 1980.

ERIOCAULON JAPONICUM Körn.

Additional bibliography: Mold., Phytologia 24: 467. 1972; Mold., Phytol. Mem. 2: 301 & 600. 1980.

ERIOCAULON JAUENSE Mold.

Additional bibliography: Mold., Phytologia 41: 423. 1979; Mold., Phytol. Mem. 2: 115, 401, & 600. 1980.

ERIOCAULON JOHNSTONII Ruhl.

Additional bibliography: Mold., Phytologia 32: 496 (1976) and 34: 274. 1976; Mold., Phytol. Mem. 2: 252, 404, & 600. 1980.

Additional citations: MASCARENE ISLANDS: Mauritius: Lorence M.33 (E--2223405).

ERIOCAULON JORDANI (Mold.) Meikle

Additional bibliography: Mold., Phytologia 41: 423. 1979; Mold., Phytol. Mem. 2: 208 & 600. 1980.

ERIOCAULON KAINANTENSE Masamune

Additional bibliography: Mold., Phytologia 24: 467. 1972; Mold., Phytol. Mem. 2: 281 & 600. 1980.

ERIOCAULON KATHMANDUENSE Satake

Additional bibliography: Mold., Phytologia 24: 467--468. 1972; Mold., Phytol. Mem. 2: 257 & 600. 1980.

ERIOCAULON KATOI Onuma

Additional bibliography: Mold., Phytologia 24: 468. 1972; Mold.,

Phytol. Mem. 2: 301 & 600. 1980.

ERIOCAULON KENGII Ruhl.

Additional bibliography: Mold., Phytologia 26: 26--27. 1973; Mold., Phytol. Mem. 2: 278 & 600. 1980.

ERIOCAULON KINABALUENSE Van Royen

Additional bibliography: Mold., Phytologia 24: 468 (1972), 36: 42 (1977), and 37: 496. 1977; Mold., Phytol. Mem. 2: 314, 400, & 600. 1980.

Additional citations: GREATER SUNDA ISLANDS: Sabah: Clemens & Clemens 51120 (Mi).

ERIOCAULON KINLOCHII Mold.

Additional bibliography: Mold., Phytologia 29: 20. 1974; Mold., Phytol. Mem. 2: 74, 78, & 600. 1980.

ERIOCAULON KIUSIANUM Maxim.

Additional bibliography: Mold., Phytologia 24: 468. 1972; Mold., Phytol. Mem. 2: 281, 301, & 600. 1980; Mold., Phytologia 53: 280. 1983.

The Tanaka & Shimada 13574, previously cited as E. kiusianum or E. cinereum R. Br., is now regarded as representing E. merrillii Ruhl. instead.

ERIOCAULON KLOTZSCHII Mold.

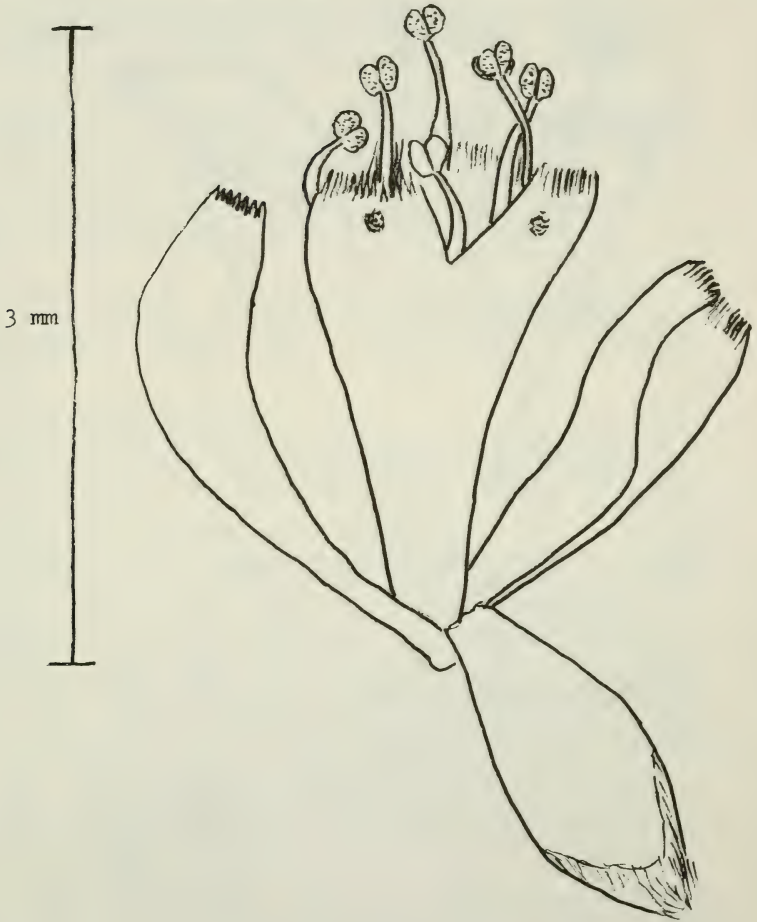
Additional bibliography: Mold., Phytologia 36, 480. 1977; Mold., Phytol. Mem. 2: 115, 121, & 600. 1980; Mold., Phytologia 53: 271. 1983.

Most of the specimens cited below were distributed as and/or previously cited by me as E. tenuifolium Klotzsch or as E. atabapense Mold., very similar taxa, possibly not specifically distinct.

Collectors have found this plant growing in white silt or sand savannas, especially in damp patches thereon, where it is often locally abundant. Huber and Tillett refer to it as "very common" on wet savannas near morichal, at 95--140 m. altitude. Collectors describe it as an herb with leaves in basal rosettes, the leaves rich-green, linear, and to 2 inches long, the scapes 10--12 inches tall with a single, terminal, globular head of white or grayish-white "flowers". They have found it in both flower and fruit in January, May, June, October, and November.

The 3 accompanying drawings are based on Davidse 17108 by courtesy of the collector.

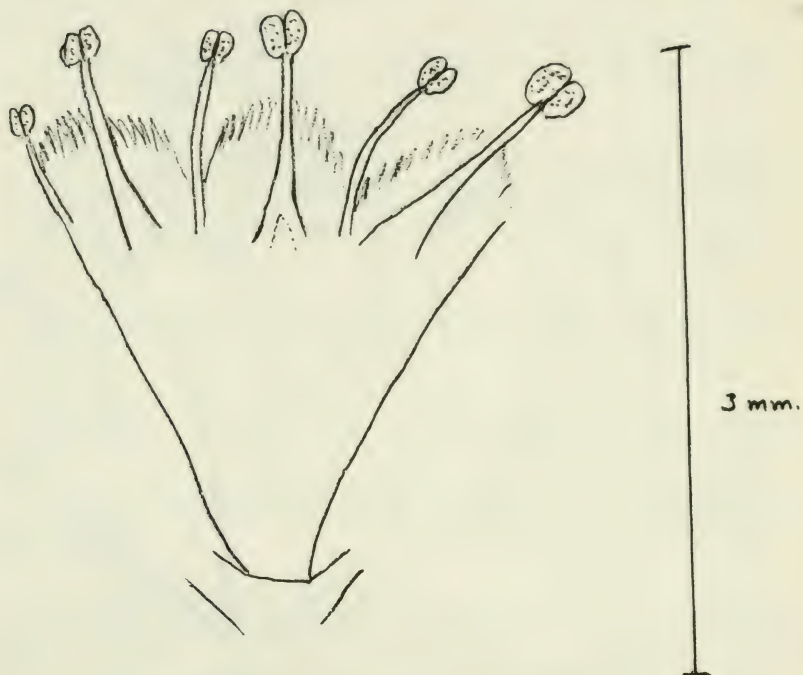
Additional citations: VENEZUELA: Amazonas: Davidse, Huber, & Tillett 17108 (E--2769550); D. Huber 2041 (Ld), 3106 (Ld), 6106 (Ld); Huber & Tillett 2780 (Ld), 5559 (Ld); Maguire, Wurdack, & Keith 41890 (N, S, S); Steyermark & Bunting 103228 (Ld, S). GUYANA: Goodland 515 (N, W--2548127); Herb. Forest Dept. Br. Guian. 7656 [field no. G.641] (N); A. C. Smith 2280 (N, S). BRAZIL: Roraima: Prance, Steward, Ramos, & Faries 9177 (Ac, N, S).



Eriocaulon klotzschii Mold.

Mature staminate flower

Stamens 6, in two whorls. Staminodes 3, each attached to inner side of inner tepal. Pistillode present.



Staminate flower (corolla tube cut open)



Young staminate flower

Eriocaulon klotzschii Mold.

Pistillate flowers apparently absent

ERIOCAULON KLOTZSCHII f. PROLIFERUM (Mold.) Mold., stat. nov.

Synonymy: Eriocaulon brevifolium var. proliferum Mold. in Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9: 278. 1957. Eriocaulon klotzschii var. proliferum (Mold.) Mold., Phytologia 18: 250. 1969.

Bibliography: Mold. in Maguire & Wurdack, Mem. N. Y. Bot. Gard. 9: 278. 1957; Mold., Bull. Jard. Bot. Brux. 27: 130. 1957; Mold., Phytologia 17: 452 (1968), 18: 250 (1969), 19: 341 (1970), and 24: 468. 1972; Mold., Phytol. Mem. 2: 115 & 600. 1980.

Recent collectors have encountered this plant in a small morichal on white sand savannas, at 100 m. altitude, in both flower and fruit in April and May, describing the "flowers" as white.

Additional citations: VENEZUELA: Amazonas: Davidse, Huber, & Tillett 16905a (Ld); Huber, Tillett, & Davidse 3710 (Vc); Maguire & Wurdack 34595 (N--type).

ERIOCAULON KOERNICKEI Britten

Additional & amended bibliography: Walp., Ann. Bot. Syst. 5: 927 (1860) and 6: 1171. 1861; Mold., Phytologia 29: 201--202 (1974) and 30: 342. 1975; Mold., Phytol. Mem. 2: 141 & 600. 1980.

ERIOCAULON KÖRNICKIANUM Van Heurck & Muell.-Arg.

Additional synonymy: Eriocaulon kornickianum Van Heurck & Muell. ex R. J. & C. S. Taylor in R. J. Taylor, New Rare Infr. Coll. Pl. [Herb. SE. Okla. St. Univ. Publ. 2:] 44. 1978. Eriocaulon kornickianum "Van Heurck & Muell.-Arg. in Van Heurck." apud Kral in Godfrey & Wooten, Aquat. Wet. Pl. SE. U. S. 515. 1979.

Additional bibliography: R. J. & C. S. Taylor in R. J. Taylor, New Rare Infr. Coll. Pl. [Herb. SE. Okla. St. Univ. Publ. 2:] 44--46, 85, 100, & 101, fig. 4. 1978; E. B. Sm., Atlas Annot. List, imp. 1, 421 (1978) and imp. 2, 421. 1979; Kral in Godfrey & Wooten, Aquat. Wetl. Pl. SE. U. S. 504, 505, 515, 517, & 518, fig. 300. 1979; Mold., Phytologia 41: 423--424. 1979; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 198. 1980; Mold., Phytol. Mem. 2: 40, 46, 48, 401, & 600. 1980; Duncan & Kartesz, Vasc. Fl. Ga. 36. 1981.

Additional illustrations: R. J. & C. S. Taylor in R. J. Taylor, New Rare Infr. Coll. Pl. [Herb. Okla. St. Univ. Publ. 2:] 45, fig. 4. 1978; Kral in Godfrey & Wooten, Aquat. Wetl. Pl. SE. U. S. 517, fig. 300. 1979.

The Taylors (1978) call this plant the "small-headed pipewort", listing it only from Muskogee and Pushmataha Counties in Oklahoma, noting that they are certain that the Muskogee locality is no longer extant and that the species has been proposed for inclusion in the national list of endangered species. They describe its habitat as "wet native prairie". Smith (1978) lists it from Benton, Logan, Madison, and Saline Counties, Arkansas.

Additional citations: OKLAHOMA: Pushmataha Co.: J. Taylor 24276 (Ne--136917), 24419 (Ne--136960).

ERIOCAULON KURTZII Tomlinson

Additional bibliography: Mold., Phytologia 24: 469 (1972) and 25: 235. 1973; Mold., Phytol. Mem. 2: 301 & 600. 1980.

ERIOCAULON KUSIROENSE Miyabe & Kudo

Additional bibliography: Mold., Phytologia 24: 469. 1972; Mold., Phytol. Mem. 2: 301 & 600. 1980.

ERIOCAULON KWANTUNGENSE Ruhl.

Additional bibliography: Mem., Phytologia 26: 27. 1973; Mold., Phytol. Mem. 2: 278 & 600. 1980.

ERIOCAULON LACUSTRE Ruhl.

Additional bibliography: Mold., Phytologia 36: 480. 1977; Mold., Phytol. Mem. 2: 89 & 601. 1980.

ERIOCAULON LANATUM H. Hess

Additional bibliography: Mold., Phytologia 24: 469. 1972; Mold., Phytol. Mem. 2: 233 & 601. 1980.

ERIOCAULON LANCEOLATUM Miq.

Additional bibliography: Fyson, Indian Sp. Erioc. pl. 23. 1923; Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Mold., Phytologia 32: 497. 1976; Mold., Phytol. Mem. 2: 261 & 601. 1980.

Additional illustrations: Fyson, Indian Sp. Erioc. pl. 23. 1923.

ERIOCAULON LANCEOLATUM var. PILOSUM Mold.

Additional bibliography: Mold., Phytologia 29: 202. 1974; Bole & Almeida, Journ. Bomb. Nat. Hist. Soc. 74: 226. 1977; Mold., Phytol. Mem. 2: 261 & 601. 1980.

ERIOCAULON LANIGERUM H. Lecomte

Additional bibliography: Mold., Phytologia 36: 480 & 492. 1977; Mold., Phytol. Mem. 2: 292 & 601. 1980.

Lecomte (1912) cites for this species only unnumbered Pierre and Thorel collections from Cochinchina.

ERIOCAULON LAOSENSE Mold.

Additional bibliography: Mold., Phytologia 24: 470 (1972), 35: 109--111 (1977), and 36: 38. 1977; Mold., Biol. Abstr. 63: 6590. 1977; Mold., Phytol. Mem. 2: 290 & 601. 1980.

ERIOCAULON LAOSENSE var. MAXWELLII Mold.

Additional bibliography: Mold., Biol. Abstr. 63: 6590. 1977; Mold., Phytologia 36: 480. 1977; Mold., Phytol. Mem. 2: 285 & 601. 1980.

ERIOCAULON LASIOLEPIS Ruhl.

Additional bibliography: Mold., Phytologia 24: 470. 1972; Mold., Phytol. Mem. 2: 296 & 601. 1980.

ERIOCAULON LATIFOLIUM J. E. Sm.

Additional & amended bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 926 & 943--945. 1860; Mold., Phytologia 41: 424. 1979; Mold., Phytol. Mem. 2: 200, 207--209, 220, 233, 235, 402, 404, & 601. 1980.

ERIOCAULON LATIFOLIUM f. PROLIFERUM Mold.

Additional bibliography: Mold., Phytologia 41: 424. 1979; Mold., Phytol. Mem. 2: 205 & 601. 1980.

ERIOCAULON LAXIFOLIUM Körn.

Additional bibliography: Mold., Phytologia 24: 470. 1972; Mold., Phytol. Mem. 2: 141 & 601. 1980.

ERIOCAULON LEPIDUM T. Koyama

Additional bibliography: Mold., Phytologia 24: 470. 1972; Mold., Phytol. Mem. 2: 285 & 601. 1980.

ERIOCAULON LEPTOPHYLLUM Kunth

Additional bibliography: Mold., Phytologia 41: 425. 1979; Mold., Phytol. Mem. 2: 141, 180, & 601. 1980.

Additional citations: BRAZIL: Minas Gerais: Irwin, Onishi, Fonseca, Souza, Santos, & Ramos 25641 (W--2801664). Paraná: Reitz & Klein 17618 (W--2548325).

ERIOCAULON LEUCOGENES Ridl.

Additional bibliography: Mold., Phytologia 36: 480. 1977; Mold., Phytol. Mem. 2: 314, 326, & 601. 1980.

Recent collectors describe this plant as having rather fleshy bright-green or yellowish-green leaves, gray-white inflorescences, dark-gray or blackish-gray involucre, and greenish-white "flow-ers". They have found it growing in damp shaded places and "com-mon in wet blang", often forming small dense cushions or loose to dense tussocks, at 2300--3420 m. altitude, in both flower and fruit from February to May.

Additional citations: GREATER SUNDA ISLANDS: Sumatra: Wilde & Wilde-Duyfjes 15329 (E--2418248), 15368 (E--2418238), 16273 (E--2418722), 16887 (E--2418287). MOUNTED CLIPPINGS: Ridl., Trans. Linn. Soc. Lond. Bot. 9: 240. 1916 (W).

ERIOCAULON LEUCOMELAS Steud.

Additional & amended bibliography: C. Muell. in Walp., Ann. Bot. Syst. 5: 926 & 941 (1860) and 6: 1171. 1861; Anon., Kew. Bull. Gen. Ind. 111. 1959; Mold., Phytologia 41: 425. 1979; Mold., Phytol. Mem. 2: 261, 272, 401, & 601. 1980.

Keenan and his associates found this plant growing in wet crevices on a rock face, 1200--2300 feet altitude, in both flower and fruit in October, describing the inflorescences as white.

Additional citations: BURMA: Tenasserim: Keenan, Aung, & Rule 1623 (E--2624666).

ERIOCAULON LIGULAEFOLIUM Alston

Additional bibliography: Mold., *Phytologia* 29: 202--203, 1974; Mold., *Phytol. Mem.* 2: 268 & 601, 1980.

ERIOCAULON LIGULATUM (Vell.) L. B. Sm.

Additional bibliography: Pfeiffer, *Nom. Bot.* 1 (2): 1150, 1874; Ruhl. in Wettstein, *Dendschr. K. Akad. Wiss. Wien Math.-Nat.* 79: 87, 1908; Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 706 & 964, fig. 480 (3) & (4), 1911; Mold., *Phytologia* 36: 481, 1977; Mold., *Phytol. Mem.* 2: 141, 353, 400--402, 426, & 601, 1980.

Additional illustrations: Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 706, fig. 480 (3) & (4), 1911.

Recent collectors have encountered this species in brejo (sedge meadows) on campos, flowering and fruiting in July.

Additional citations: BRAZIL: Paraná: Dombrowski & Neto 104 (ld); Hartschbach 11320 (Eu--37371), 32591 (Ba); Reitz & Klein 13403 (N).

ERIOCAULON LINEARE Small

Additional bibliography: Worsdell, *Ind. Lond. Suppl.* 1: 375, 1941; Kral in Godfrey & Wooten, *Aquat. Wetl. Pl. SE. U. S.* 504, 505, 508, 510, 512, 513, & 515, fig. 297, 1979; Mold., *Phytologia* 41: 425 (1979) and 44: 134, 1979; J. T. & R. Kartesz, *Syn. Checklist Vasc. Fl.* 2: 197, 1980; Mold., *Phytol. Mem.* 2: 19, 22, 25, 26, 402, & 601, 1980; Duncan & Kartesz, *Vasc. Fl. Ga.* 36, 1981; Mold., *Phytologia* 52: 111 & 112 (1982) and 53: 282, 1983.

Additional illustrations: Kral in Godfrey & Wooten, *Aquat. Wetl. Pl. SE. U. S.* 512, fig. 297, 1979.

Godfrey notes for his Franklin County, Florida, collection: "in borrow-peat pond, completely covering the substrate of open parts of the pond, the substrate very soft and loose, leaves very soft and flaccid, scapes flaccid below water surface and not at all rigid above water surface, water 5--8 cm. deep" and found it in both flower and fruit in October. Other collectors have encountered it in shallow grassy limesink ponds, in wet pinelands, and in shallow water of open ponds or borrow-pits, in both flower and fruit in March, June, and October.

Thorne 6551 appears to represent an extremely short-leaved form of the species.

Material of *E. lineare* has been widely misidentified and distributed in herbaria as *E. septangulare* With. On the other hand, the Stoutmire 1063, distributed as *E. lineare*, actually is *E. compressum* Lam., while B. Williams s.n. [5-2-74] is *Syngonanthus flavidulus* (Michx.) Ruhl.

Additional citations: GEORGIA: Baker Co.: Thorne 7030 (It). Calhoun Co.: Thorne 4696 (It). Decatur Co.: Thorne 3957 (It), 6551 (It). Dougherty Co.: Thorne 5022 (It). Lee Co.: Thorne & Muenscher 8994 (It). FLORIDA: Franklin Co.: Godfrey 76828 (W--2902231). Leon Co.: Wiegand & Manning 681 (It). ALABAMA: Covington Co.: Nieland 34 (N). MISSISSIPPI: George Co.: Thomas, Al-

len, & Landry 43057 (Ne--103100).

ERIOCAULON LINEARE f. GIGAS (Mold.) Mold., Phytologia 44: 134. 1979.

Additional bibliography: Mold., Phytologia 34: 402 (1976) and 44: 134. 1979; Mold., Phytol. Mem. 2: 22, 402, & 601. 1980; Mold., Phytologia 52: 111 & 112. 1982.

The Thorne collection, cited below, was growing in 2 feet of water and exhibits both very long peduncles and leaves; the Haynes collection exhibits very long scapes and one plant also has very long leaves. These collections were originally distributed, respectively, as E. septangulare With. and E. lineare Small.

Additional citations: GEORGIA: Decatur Co.: Thorne 4475 (It). ALABAMA: Covington Co.: R. R. Haynes 7555 (N).

ERIOCAULON LINEARIFOLIUM Körn.

Additional bibliography: Mold., Phytologia 41: 425. 1979; Mold., Phytol. Mem. 2: 141, 174, & 601. 1980.

Additional citations: BRAZIL: Bahia: Anderson, Stieber, & Kirkbride 36810 (W--2709601). Mato Grosso: Hatschbach & Guimarães 24560 (W--2705921).

ERIOCAULON LIVIDUM f. Muell.

Additional bibliography: C. A. Gardn., Enum. Pl. Austral. Occid. 1: 17. 1930; T. B. Muir, Muelleria 2: 140. 1972; Mold., Phytologia 41: 425 & 455. 1979; Mold., Phytol. Mem. 2: 336 & 601. 1980.

ERIOCAULON LONGICUSPE Hook. f.

Additional bibliography: Fyson, Indian Sp. Erioc. 45, pl. 25. 1923; Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Mold., Phytologia 41: 425. 1979; Mold., Phytol. Mem. 2: 268, 400, & 601. 1980.

Additional illustrations: Fyson, Indian Sp. Erioc. 45, pl. 25. 1923.

ERIOCAULON LONGICUSPE var. ZEYLANICUM Mold.

Additional bibliography: Mold., Phytologia 41: 425. 1979; Mold., Phytol. Mem. 2: 268 & 601. 1980.

ERIOCAULON LONGIPEDUNCULATUM H. Lecomte

Additional bibliography: Mold., Phytologia 41: 425. 1979; Mold., Phytol. Mem. 2: 331 & 601. 1980.

ERIOCAULON LONGIPETALUM Rendle

Additional bibliography: Mold., Phytologia 29: 205. 1974; Mold., Phytol. Mem. 2: 233 & 601. 1980.

ERIOCAULON LONGIROSTRUM Alv. Silv. & Ruhl.

Additional bibliography: Mold., Phytologia 24: 473. 1972; Mold., Phytol. Mem. 2: 141 & 601. 1980.

ERIOCAULON LUSTRATUM Van Royen, Alpine Fl. N. Guin. 2: 828--829, fig. 282 A--F. 1979.

Bibliography: Van Royen, Alpine Fl. N. Guin. 2: 825 & 828--829, fig. 282 A--F. 1979; Mold., Phytologia 50: 254 & 270. 1982.

Illustrations: Van Royen, Alpine Fl. N. Guin. 2: 829, fig. 282 A--F. 1979.

Van Royen (1979) has based this species on Coode NGF.40276 from the northern and southern slopes of Mt. Giluwe, Papua, deposited in the Bishop Museum herbarium. He cites also Van Royen 11254 and Willis s.n., asserting that this endemic plant is found "Partly submerged, in pools of an alpine bog or in boggy ground on steep slopes", at 3200--3720 m. altitude, in both flower and fruit in July.

Citations: MOUNTED ILLUSTRATIONS: Van Royen, Alpine Fl. N. Guin. 2: 829, fig. 282 A--F. 1979 (Ld).

ERIOCAULON LUZULAEFOLIUM Mart.

Additional & emended bibliography: Miq., Fl. Ind. Bat. Suppl. 1: 268. 1860; Hosseus, Beih. Bot. Centralbl. 28 (2): 369--373. 1911; Craib, Kew Bull. Misc. Inf. 1912: 421. 1912; Fyson, Indian Sp. Erioc. pl. 8. 1923; Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 148. 1979; Mold., Phytologia 41: 425. 1979; Mold., Phytol. Mem. 2: 257, 261 268, 270, 272, 285, 292, & 601. 1980.

Additional illustrations: Fyson, Indian Sp. Erioc. pl. 8. 1923.

Miquel (1860) reports the vernacular name, "sianga", for this plant. Craib (1912) -- misspelled "Graib" -- cites Kerr 1635 & 1932 from Thailand, where the species is said to be found in swamps and at the edges of streams, at 330--420 m. altitude. Recent collectors have encountered it in open wet grasslands, on clay soil of moist savannas, and "gregarious in moist places in dry deciduous forests with lalang grass on limestone", reporting the "styles white", at 800--1100 m. altitude, in both flower and fruit in September and November.

Additional citations: INDIA: Maharashtra: Padhya 2 (Ld), 6 (Ld). THAILAND: Beusekom, Phengkhlai, Geesink, & Wongwan 3602 (E--2383276), 4261 (E--2362529); Charoenphol, Larsen, & Werncke 4684 (E--2368145, E--2588132). MOUNTED ILLUSTRATIONS: Schnitzl., Iconogr. 1: pl. 46, fig. 2 & 5. 1845 (Ba--381098).

ERIOCAULON MACROBOLAX Mart.

Additional bibliography: Mold., Phytologia 29: 206. 1974; Mold., Phytol. Mem. 2: 141 & 601. 1980; Mold., Phytologia 48: 253. 1981.

The Macado 2589 & 2620, previously reported by me as E. macrobolax, are actually, instead, the newly described E. singulare Mold.

ERIOCAULON MACROPHYLLUM Ruhl.

Additional bibliography: Mold., Phytologia 29: 206. 1974; Mold., Phytol. Mem. 2: 314 & 601. 1980.

ERIOCAULON MACULATUM Schinz

Additional bibliography: Mold., Phytologia 41: 426 & 458. 1979;

Mold., Phytol. Mem. 2: 245 & 601. 1980.

ERIOCAULON MADAGASCARIENSE Mold.

Additional bibliography: Mold., Phytologia 24: 474. 1972; Mold., Phytol. Mem. 2: 250 & 601. 1980.

ERIOCAULON MAGNIFICUM Ruhl.

Additional bibliography: Worsdell, Ind. Lond. Suppl. 1: 375. 1941; Mold., Phytologia 36: 482. 1977; Klein, Sellowia 31: 132. 1979; Mold., Phytol. Mem. 2: 141, 353, 401, & 601. 1980.

Additional citations: BRAZIL: Rio Grande do Sul: Deslandes s.n. [Herb. Silveira 220; Herb. Mus. Rio Jan. 126565] (W--2700823). Santa Catarina: Reitz & Klein 857 (W--2141593). MOUNTED CLIPPINGS: Alv. Silv., Fl. Mont. 1: 421. 1928 (Ld, N, W).

ERIOCAULON MAGNIFICUM var. GOYAZENSE Mold.

Additional bibliography: Mold., Phytologia 29: 206. 1974; Mold., Phytol. Mem. 2: 141 & 601. 1980.

ERIOCAULON MAGNUM Abbiatti

Additional bibliography: Mold., Phytologia 41: 426. 1979; Mold., Phytol. Mem. 2: 177, 186, & 601. 1980.

ERIOCAULON MAJUSCULUM Ruhl.

Additional bibliography: Ruhl. in Wettstein, Denkschr. K. Akad. Wiss. Wien Math.-Nat. 79: 87. 1908; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 10. 1913; Mold., Phytologia 36: 482 (1977) and 37: 31. 1977; Mold., Phytol. Mem. 2: 141 & 601. 1980.

Recent collectors have found this plant growing as an herb among marshy vegetation at the borders of lakes with Sphagnum, at 2100 m. altitude, in anthesis in October.

Additional citations: BRAZIL: Rio de Janeiro: Maas & Martinelli 3202 (Ld).

ERIOCAULON MAJUSCULUM var. COMPOSITUM Ruhl., Denkschr. K. Akad. Wiss. Wien Math.-Nat. 79: 87. 1908.

Bibliography: Ruhl., Denkschr. K. Akad. Wiss. Wien Math.-Nat. 79: 87. 1908; Fedde & Schust., Justs Bot. Jahresber. 39 (2): 10. 1913; Mold., Phytol. Mem. 2: 141 & 601. 1980.

Ruhland (1908) describes this taxon as "capitulis per paucos compositis. -- Für die Gattung sehr auffällig". It is based on an unnumbered Wettstein collection from "Sumpfige Stellen des Camp bei Cerqueira-Cesar; 500 m ü. d. M.; VII, 1901" in Brazil.

ERIOCAULON MALAISSEI Mold.

Additional bibliography: Mold., Phytologia 32: 498--499. 1976; Mold., Phytol. Mem. 2: 220 & 601. 1980.

ERIOCAULON MALAISSEI f. VIVIPARUM Mold.

Additional bibliography: Mold., Phytologia 24: 475--476. 1972; Mold., Phytol. Mem. 2: 220 & 601. 1980.

ERIOCAULON MAMFEENSE Meikle

Synonymy: Eriocaulon mamfeense Meikle ex Mold., Phytologia 32: 499, sphalm. 1976.

Additional bibliography: Mold., Phytologia 41: 426. 1979; Mold., Phytol. Mem. 2: 214 & 601. 1980.

ERIOCAULON MANNII N. E. Br.

Additional bibliography: Mold., Phytologia 29: 207. 1974; Mold., Phytol. Mem. 2: 216, 232, & 601. 1980.

ERIOCAULON MARGARETAE Fyson

Additional bibliography: Mold., Phytologia 29: 207. 1974; Bole & Almeida, Journ. Bomb. Nat. Hist. Soc. 74: 226--227. 1977; Mold., Phytol. Mem. 2: 261 & 601. 1980.

Bole & Almeida (1977) have selected Sedgwick 2979 as the lectotype of this species from among the two collections originally cited by Fyson (1923). They designate Fyson 3839 as a syntype.

ERIOCAULON MATOPENSE Rendle

Additional bibliography: Mold., Phytologia 24: 476. 1972; Mold., Phytol. Mem. 2: 237 & 601. 1980.

ERIOCAULON MEGAPOTAMICUM Walp

Additional bibliography: Mold., Phytologia 36: 479 & 482. 1977; Mold., Phytol. Mem. 2: 141 & 601. 1980.

Additional citations: BRAZIL: Santa Catarina: Smith, Reitz, & Klein 7683 (W--2267565). MOUNTED CLIPPINGS: Walp, Arkiv Bot. 26A (9): 8. 1934 (W).

ERIOCAULON MEIKLEI Mold.

Additional bibliography: Mold., Phytologia 41: 426. 1979; Mold., Phytol. Mem. 2: 200, 205, 207, 212, & 601. 1980.

ERIOCAULON MELANOCEPHALUM Kunth

Additional synonymy: Eriocaulon usterianum Beauverd, Bull. Herb. Boiss., ser. 2, 8: 284--287, fig. 9 B. 1908. Eriocaulon melanocephalum ssp. usterianum Beauverd, Bull. Herb. Boiss., ser. 2, 8: 284--287, fig. 9B 15--27. 1908. Eriocaulon melanocephalum var. usterianum Beauverd ex Angely, Fl. Anal. Fitogeogr. Est. S. Paulo, ed. 1, 6: 1157. 1972.

Additional & emended bibliography: Beauverd, Bull. Herb. Boiss., ser. 2, 8: 284--287, fig. 9B 15--28. 1908; Prain, Ind. Kew. Suppl. 4, imp. 1, 82 (1913) and imp. 2, 82. 1938; Mold., Résumé 51, 66, 71, 78, 89, 285, 293, 309, & 481. 1959; Mold., Phytologia 18: 243, 279--280, & 301--302. 1969; Mold., Fifth Summ. 2: 493, 495, 515, 546, 586, & 938. 1971; Mold., Phytologia 24: 476--477 (1972) and 36: 482. 1977; Giulietti, Bol. Bot. Univ. S. Paulo 6: 39--47, fig. 3 & 4. 1978; Mold., Phytologia 41: 414 (1979) and 44: 384. 1979; Mold., Phytol. Mem. 2: 89, 108, 115, 121, 126, 142, 402, & 601. 1980; Mold., Phytologia 50: 247, 260, & 270. 1982.

Additional & emended illustrations: Beauverd, Bull. Herb. Boiss.,

ser. 2, 8: 285, fig. 98 15--28. 1908; Giulietti, Bol. Bot. Univ. S. Paulo 6: 42, fig. 3 & 4. 1978.

Recent collectors describe this species as an aquatic plant immersed in streams 30 cm. deep and floating in the water of an agarapé, the heads dark gray-green or blackish, the "flowers" white, and have found it growing at 80 m. altitude, in flower in August and November.

Material of this species has been misidentified and distributed in some herbaria as E. spruceanum f. fluitans Herzog, an as yet poorly understood taxon.

Additional citations: COLOMBIA: Meta: Pennell 1635 (W--1041854), 1637 (W--1041855). VENEZUELA: Amazonas: O. Huber 982 (Ld), 2730 (Ld), 4684 (Ld). Bolívar: Steyermark 59256 (W--1987403); Wurdack & Monachino 40912 (W--2223446). Guárico: Delascio, Montes, & Davidse 11537 (E--2994265). FRENCH GUIANA: Hook s.n. [8 Mars 1962] (Cy, Cy, Ld). BRAZIL: Amapá: Austin, Nauman, Rabelo, Rosário, & Santos 7302 (Ld, N).

ERIOCAULON MELANOCEPHALUM f. LONGIPES (Griseb.) Mold., Phytologia 44: 384. 1979.

Additional synonymy: Eriocaulon melanocephalum var. longipes Griseb., Cat. Pl. Cub. 226. 1866.

Additional bibliography: Mold., Phytologia 32: 499 (1976) and 44: 384. 1979; Mold., Phytol. Mem. 2: 89, 402, & 601. 1980.

ERIOCAULON MELANOCEPHALUM ssp. USTERIANUM Beauverd

This taxon is now regarded as a synonym of typical E. melanocephalum Kunth, which see.

ERIOCAULON MELANOLEPIS Alv. Silv.

Additional bibliography: Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Mold., Phytologia 29: 207. 1974; Mold., Phytol. Mem. 2: 142 & 601. 1980.

Additional citations: MOUNTED ILLUSTRATIONS: Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: 163, pl. 5. 1921 (Ld, W); Alv. Silv., Fl. Mont., pl. 6. 1928 (Ld, W).

ERIOCAULON MERRILLII Ruhl.

Additional synonymy: Eriocaulon merrillii var. merrillii [Ruhl.] ex Chang, Fl. Taiwan 5: 183. 1978. Eriocaulon kiusianum sensu Mold. ex Chang, Fl. Taiwan 5: 183, in syn. [not E. kiusianum Maxim., 1893].

Additional bibliography: Huang, Taiwania 15: 152. 1970; Mold., Phytologia 34: 397, 402--404, & 492 (1976) and 36: 38. 1977; Chang, Fl. Taiwan 5: [179], 183, & 185 (1978) and 6: 654 & 663. 1980; Mold., Phytol. Mem. 2: 283, 292, 303, 304, 307, 401, 402, 404, & 601. 1980; Mold., Phytologia 53: 280. 1983.

Huang (1970) describes the pollen grains of E. merrillii as 23--25 μ wide on the basis of Sasaki 327 from Taiwan. Chang (1978) reports the plant from marshes on Taiwan, citing Hsu 3345,

and listing the Philippines as its only other known distribution. He affirms that the Tanaka & Shimada 13574, previously cited by me as E. cinereum R. Br. or as E. kiusianum Maxim., actually represents E. merrillii.

Material of E. merrillii has also been distributed in some herbaria as E. formosanum Hayata.

Collectors have found E. merrillii in both flower and fruit in May.

Additional & amended citations: TAIWAN: Tanaka & Shimada 13574 (B, Ca--517642, Go, Mi, Mu, N, S).

ERIOCAULON MERRILLII var. SUISHAENSE (Hayata) Chang, Fl. Taiwan 5: 184--185, pl. 1315. 1978.

Synonymy: Eriocaulon suishaense Hayata, Icon. Fl. Formos. 10: 55, fig. 31. 1921. Eriocaulon suishaense Hayata apud Wangerin, Justs Bot. Jahresber. 49 (1): 160, sphalm. 1927. Eriocaulon suishaense Hayata apud A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929. Eriocaulon suishaense var. okinawense Satake, Journ. Jap. Bot. 15: 141. 1939. Eriocaulon nigrum var. suishaense (Hayata) Hatus. & Koyama, Journ. Jap. Bot. 31: 233. 1956. Eriocaulon nigrum var. suishaense "Hatusima & Koyama" ex Hatus., Mem. South. Indust. Sci. Inst. Kagoshima Univ. 3 (2): 123. 1962. Eriocaulon nigrum var. suishaense "Hatus. & Koyama" ex Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 191. 1969.

Bibliography: Hayata, Icon. Pl. Formos. 10: 55--56 & 272, fig. 31. 1921; Mak. & Namoto, Fl. Jap., ed. 1, 1308. 1925; Wangerin, Justs Bot. Jahresber. 49 (1): 160. 1927; Sasaki, List Pl. Formos. 99. 1928; A. W. Hill, Ind. Kew. Suppl. 7: 89. 1929; Sasaki, Cat. Govt. Herb. 119. 1930; Mak. & Namoto, Fl. Jap., ed. 2, 1515. 1931; Fedde, Justs Bot. Jahresber. 49 (2): 423. 1932; Masamune, Short Fl. Formos. 263. 1936; Namoto, Suppl. Fl. Jap. 1040. 1936; Satake, Journ. Jap. Bot. 15: 141. 1939; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6, 7, 9, 11, 12, 24, 78, & 87, fig. 1E, 2B, & 5E. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.] 15--16, pl. 1, fig. 2. 1940; Mold., Known Geogr. Distrib. Erioc. 25 & 40. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 133, 140, & 206. 1949; Mold., Phytologia 3: 143. 1948; Sonohara, Tawada, & Amano [ed. E. H. Walker], Fl. Okin. 205. 1952; Hatus. & Koyama, Journ. Jap. Bot. 31: 233. 1956; Mold., Résumé 172, 181, 290, & 483. 1959; Hatus., Mem. South. Indust. Sci. Inst. Kagoshima Univ. 3 (2): 123. 1962; Mold., Résumé Suppl. 17: 11. 1968; Tomlinson in C. R. Metcalfe, Anat. Monocot. 3: 191. 1969; Mold., Phytologia 19: 453. 1970; Mold., Fifth Summ. 1: 312 & 313 (1971) and 2: 507, 514, & 942. 1971; Mold., Phytologia 25: 81 (1972), 28: 457 (1974), 29: 232--233 (1974), and 34: 264, 393, 493, & 495. 1976; Chang, Fl. Taiwan 5: [179] & 184--185, pl. 1315 (1978) and 6: 654 & 663. 1980; Mold., Phytol. Mem. 2: 283, 303, 304, 402, 404, & 601. 1980.

Illustrations: Hayata, Icon. Pl. Formos. 10: 56, fig. 31. 1921; Satake in Nakai & Honda, Nov. Fl. Jap. 6: 6, 7, & 11, fig. 1E, 2B, & 5E. 1940; Satake, Bull. Tokyo Sci. Mus. 4: [Rev. Jap. Erioc.]

pl. 1, fig. 2. 1940; Chang, Fl. Taiwan 5: 184, pl. 1315. 1978.

Chang (1978) asserts that this variety is native to the marshes of both northern and southern Taiwan and in the Ryukyu islands. He cites from Taiwan Kawakami s.n., Masamune 27311, Sasaki s.n., and Shimada 27310. By mistake he labels his new trinomial "sp. nov." instead of "stat. nov."

Recent collectors have encountered this plant along riversides and at the edges of streams by roadsides, in both flower and fruit in July and August.

The two Walker & al. collections, cited below, were previously erroneously cited by me as E. buergerianum Körn.

Citations: RYUKYU ISLANDS: Okinawa: Walker, Sonohara, Tawada, & Amano 7120 (N); Walker, Tawada, & Amano 6490 (N). MOUNTED ILLUSTRATIONS: Chang, Fl. Taiwan 5: 184, pl. 1315. 1978 (Ld).

ERIOCAULON MESANTHEMOIDES Ruhl.

Additional bibliography: Mold., Phytologia 29: 208. 1974; Mold., Phytol. Mem. 2: 224, 226, 239, & 601. 1980.

ERIOCAULON MEXICANUM Mold.

Additional bibliography: Mold., Phytologia 24: 477. 1972; Mold., Phytol. Mem. 2: 62 & 601. 1980; Mold., Phytologia 53: 274. 1983.

Additional citations: MEXICO: Jalisco: Pringle 11202 (It--isotype).

ERIOCAULON MICROCEPHALUM H.B.K.

Additional synonymy: Eriocaulon microcephalum H.B.K. ex Latorre, Ortega, & Inca, Cienc. Naturaleza 18: 62, sphalm. 1977. Eriocaulon microcephalum Mold., in herb.

Additional bibliography: Latorre, Ortega, & Inca, Cienc. Naturaleza 18: 62. 1977; Mold., Phytologia 41: 426. 1979; Øllgaard & Balslev, Rep. Bot. Inst. Univ. Aarhus 4: 42, 61, 64, & 103. 1979; J. T. & R. Kertesz, Syn. Checklist Vasc. Fl. 2: 197. 1980; Mold., Phytol. Mem. 2: 108, 115, 128, 133, 402, & 601. 1980; Cleef, Disser. Bot. 61: 303. 1981.

Recent collectors refer to this plant as a small, cushion-forming, caespitose, gregarious herb, with "whitish heads" and dark-green leaves, growing 1--2 inches tall, often forming mats 3--4 feet in diameter. They have encountered it submerged in small ponds in dry scrub, forming loose cushions in the shade of other plants in boggy depressions on heavily grazed páramos with such boggy depressions, small lakes, and steep escarpments, forming firm cushions in wet depressions on disturbed páramos with spring bogs dominated by large species of Carex and Juncus, in boggy depressions in Espeletia páramos dominated by cushion plants like Plantago rigida, Distichia, and Werneria and adjacent wet slopes where it forms firm cushions along streams, in wet páramo vegetation with an abundance of Espeletia hartwegiana at small springs, in xerophytic scrub 2--3 m. tall intermingled with meadows and drier grassland, and "cushion-forming in swamps near lakes, the surrounding

páramos heavily grazed by cattle, sheep, and rabbits", at altitudes of 2900--4300 meters, in flower in May and from June to September, and in fruit in May, July, and August.

Rzedowski 34274 is a mixture with something not eriocaulaceous.

Latorre and his associates (1977) list a Sodiro collection of Eriocaulon microcephalum from "los páramos cenagosos de Huagrabamba" in Pichincha, Ecuador (no. 1076). Dudley reports the species "rare in high wet grasslands" in Cuzco, Peru. Barclay & Juajibioy describe it as having "very small stems 3 cm. tall, with fine, erect leaves that are white-hairy beneath, to 5 mm. long and 0.5 mm. wide, the flowers slightly elevated above the mat on white pedicels, only brown calyxes remaining now" and found it growing on "open slopes near lake with grasses, herbs, and occasional shrubs, high humidity, continual rains, many rivulets on slopes". Of course, the "calyxes" to which he refers were doubtless the involucreal bracts.

Material of this species has been misidentified and distributed in some herbaria as Paepalanthus sp. and even as "Paepalanthus sp. nov." [by Ferreira in 1978]. On the other hand, the Cutler 7038, distributed as Eriocaulon microcephalum, actually is Paepalanthus manicatus var. pulvinatus Herzog.

Additional citations: MEXICO: Federal District: J. Rzedowski 34274 in part (Mi, N). México: Pringle 13228 (It). COSTA RICA: Puntarenas: Weston 5986 (N). COLOMBIA: Cundinamarca: Cleef 4111 (W--2850660); Cuatrecasas & Idrobo 27053 (E--2613375). VENEZUELA: Apure: Steyermark, Dunsterville, & Dunsterville 101241 (N). ECUADOR: Azuay: Balslev 1227 (Ld, N, N); Camp E.2582 (W--2056991); Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 4991 (Ac, E--2773088, Eu--55330), 5054 (Ac, E--2773089, Eu--55329, Ut--3525758). Carchi: Holm-Nielsen, Jeppesen, Løjtnant, & Øllgaard 5277 (Ac, E--2773092); Øllgaard & Balslev 8460 (Ac). Chimborazo: Øllgaard & Balslev 8949 (Ac, Ld, N, N). Cotopaxi: Balslev 1055 (Ld, N); Øllgaard & Balslev 9862 (Ac, N, N). Napo: Boeke 784 (N); Øllgaard & Balslev 8901 (Ac, Ld, N, N). Pichincha: Fosberg 22447 (W--2109563). Santiago Zamora: Barclay & Juajibioy 8751 (E--2810114). Tungurahua: Asplund 9958 (W--2224158). PERU: Cuzco: Dudley 11194 (E--2152854); Vargas C. 13330 (W--2368189).

ERIOCAULON MIKAWANUM Satake & Koyama

Additional bibliography: Mold., Phytologia 24: 477. 1972; Mold., Phytol. Mem. 2: 301 & 601. 1980.

ERIOCAULON MILHOENSE Herzog

Additional bibliography: Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Mold., Phytologia 26: 30. 1973; Mold., Phytol. Mem. 2: 142 & 601. 1980.

ERIOCAULON MINIMUM Lam.

Additional bibliography: Useful Pl. Jap. 3: pl. 966. 1895; A-

non., Kew Bull. Gen. Ind. 111. 1959; Mold., Phytologia 36: 483. 1977; Mold., Phytol. Mem. 2: 261, 268, 270, & 602. 1980.

Additional illustrations: Useful Pl. Jap. 3: pl. 966 (in color). 1895.

ERIOCAULON MINUSCULUM Mold.

Additional bibliography: Mold., Phytologia 24: 478. 1972; Mold., Phytol. Mem. 2: 278 & 602. 1980.

ERIOCAULON MINUTISSIMUM Ruhl.

Additional & amended bibliography: León, Fl. Cuba, imp. 1, 1: 280 & 423. 1946; Mold., Phytologia 32: 500. 1976; Mold., Phytol. Mem. 2: 89 & 602. 1980.

ERIOCAULON MINUTUM Hook. f.

Additional bibliography: Fyson, Journ. Indian Bot. 2: 139, fig. 6. 1921; Fyson, Indian Sp. Erioc. pl. 36. 1923; Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Mold., Phytologia 32: 500--501. 1976; Mold., Phytol. Mem. 2: 261, 270, & 602. 1980.

Additional illustrations: Fyson, Journ. Indian Bot. 2: 139, fig. 6. 1921; Fyson, Indian Sp. Erioc. pl. 36. 1923.

ERIOCAULON MIQUELIANUM Körn.

Additional bibliography: Lecomte, Notul. Syst. 1: 192. 1909; Mak., Ill. Fl. Jap. [724]. 1924; Mak., Gensyoku Yagai-shokubutu [Nature-Col. Wild Pl.] 3: 184. 1933; Terasaki, Nippon Shokubutsu Zufu [Jap. Bot. Illust. Album] 1845. 1933; Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Mold., Phytologia 34: 404 & 406. 1976; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 148. 1979; Mold., Phytol. Mem. 2: 301, 303, & 602. 1980.

Additional illustrations: Mak., Ill. Fl. Jap. [724]. 1924; Mak., Gensyoku Yagai-shokubutu [Nature-Col. Wild Pl.] 3: 184. 1933; Terasaki, Nippon Shokubutsu Zufu [Jap. Bot. Illust. Album] 1845. 1933; Mak., Illust. Fl. Nipp. 771, fig. 2312. 1940.

The Oh 85, distributed as E. miquelianum, actually is E. nipponicum Maxim.

Additional citations: MOUNTED ILLUSTRATIONS: Mak., Illust. Fl. Nipp. 771, fig. 2312. 1940 (Ld).

ERIOCAULON MIQUELIANUM var. ATROSEPALUM Satake

Additional bibliography: Mold., Phytologia 24: 478. 1972; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON MIQUELIANUM var. INVOLUCRATUM Nakai

Additional bibliography: Mold., Phytologia 24: 478. 1972; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON MIQUELIANUM var. LUTCHUENSE (Koidz.) T. Koyama

Additional bibliography: Mold., Phytologia 41: 426. 1979; Mold., Phytol. Mem. 2: 303, 403, & 602. 1980.

ERIOCAULON MISERRIMUM Ruhl.

Additional bibliography: Mold., *Phytologia* 36: 483. 1977; Mold., *Phytol. Mem.* 2: 91 & 602. 1980.

ERIOCAULON MISERUM Körn.

Additional & amended bibliography: Fyson, *Journ. Indian Bot.* 3: 13--15, pl. 47 & 48. 1922; Fyson, *Indian Sp. Erioc.* pl. 47 & 48. 1923; Worsdell, *Ind. Lond. Suppl.* 1: 376. 1941; Mold., *Phytologia* 41: 427. 1979; Mold., *Phytol. Mem.* 2: 257, 261, 270, 292, & 602. 1980.

Additional & amended illustrations: Fyson, *Journ. Indian Bot.* 3: pl. 47 & 48. 1922; Fyson, *Indian Sp. Erioc.* pl. 47 & 48. 1923.

Lecomte (1912) cites for this species only an unnumbered Lecomte & Finet collection from Annam and of Bon from Tonkin, Vietnam.

ERIOCAULON MISSIONUM Castell.

Additional bibliography: Mold., *Phytologia* 41: 427. 1979; Mold., *Phytol. Mem.* 2: 186 & 602. 1980.

ERIOCAULON MITOPHYLUM Hook. f.

Additional bibliography: Mold., *Phytologia* 36: 483. 1977; Mold., *Phytol. Mem.* 2: 261, 270, & 602. 1980.

ERIOCAULON MODESTUM Kunth

Additional bibliography: Ruhl in Wettstein, *Dankschr. K. Akad. Wiss. Math.-Nat.* 79: 87. 1908; Hocking, *Excerpt. Bot. A.* 23: 388. 1974; Mold., *Phytologia* 41: 427. 1979; Mold., *Phytol. Mem.* 2: 142, 180, 401, 402, & 602. 1980; Mold. in Harley & Mayo, *Toward Checklist Fl. Bahia* 73. 1980.

Recent collectors describe this species as a fleshy herb, to 40 cm. tall, the leaves pale-green, the involucral bracts dark, and the flowers white, and have found it growing along wet river margins and partly submerged in streams in a "general area of" "sandstone, metamorphic and quartzite rock outcrops with associated marsh, damp flushes, and grassland, and some cutover mixed deciduous woodland by streams and cerrado", at 1500--1600 m. altitude, in anthesis in March.

The Dusén 2467 collection, at least on some sheets, includes some plants of f. viviparum Herzog.

Additional citations: BRAZIL: Bahia: Harley, Mayo, Storr, Santos, & Pinheiro in Harley 19651 (N); Hatschbach 45127 (Ld). Goiás: Hatschbach 43786 (Ld, W--2932035). Paraná: Dusén 2467 in part (W--2700816, W--photo).

ERIOCAULON MODESTUM var. *BREVIFOLIUM* Mold.

Additional bibliography: Hocking, *Excerpt. Bot. A.* 23: 388. 1974; Mold., *Phytologia* 41: 427. 1979; Mold., *Phytol. Mem.* 2: 142 & 602. 1980.

Hatschbach has found this plant growing in brejo (sedge meadow) in both flower and fruit in August.

Additional citations: BRAZIL: Goiás: Hatschbach 43159 (Ld, W--

2931952); Irwin, Harley, & Smith 32175 (W--2709600).

ERIOCAULON MODESTUM f. GRANDIFOLIUM Herzog

Additional bibliography: Mold., *Phytologia* 29: 209. 1974; Mold., *Phytol. Mem.* 2: 142 & 602. 1980.

ERIOCAULON MODESTUM f. RIGIDIFOLIUM Herzog

Additional bibliography: Mold., *Phytologia* 24: 479. 1972; Mold., *Phytol. Mem.* 2: 142 & 602. 1980.

ERIOCAULON MODESTUM f. VIVIPARUM Herzog

Additional bibliography: Mold., *Phytologia* 36: 484. 1977; Mold., *Phytol. Mem.* 2: 142, 180, 401, 402, & 602. 1980.

The photograph of Dusén 2467 in the United States National Herbarium in Washington shows one scape representing this form among many others of the typical form.

Additional citations: BRAZIL: Paraná: Dusén 2467 in part (W--photo).

ERIOCAULON MOKALENSE Mold.

Additional bibliography: Mold., *Phytologia* 34: 404. 1976; Mold., *Phytol. Mem.* 2: 250 & 602. 1980.

ERIOCAULON MOLINAE L. O. Williams

Additional bibliography: Mold., *Phytologia* 32: 501 (1976) and 34: 274. 1976; Mold., *Phytol. Mem.* 2: 62, 75, 405, & 602. 1980.

ERIOCAULON MONOCOCCOS Nakai

Additional bibliography: Mold., *Phytologia* 24: 480. 1972; Mold., *Phytol. Mem.* 2: 301 & 602. 1980.

ERIOCAULON MONOCOCCOS var. LATIFOLIUM Nakai

Additional bibliography: Mold., *Phytologia* 24: 480. 1972; Mold., *Phytol. Mem.* 2: 301 & 602. 1980.

ERIOCAULON MONOSCAPUM F. Muell.

Additional bibliography: T. B. Muir, *Muelleria* 2: 140. 1972; Mold., *Phytologia* 24: 480--481 (1972) and 41: 415. 1979; Mold., *Phytol. Mem.* 2: 336 & 602. 1980.

ERIOCAULON MONTANUM Van Royen

Additional bibliography: Mold., *Phytologia* 41: 427. 1979; Van Royen, *Alpine Fl. N. Guin.* 2: 825, 833, 834, & 836, fig. 283 G--M & pl. 95. 1979; Mold., *Phytol. Mem.* 2: 326 & 602. 1980; Mold., *Phytologia* 50: 254. 1982.

Additional illustrations: Van Royen, *Alpine Fl. N. Guin.* 2: 825 & 833, fig. 283 G--M & pl. 95. 1979.

Recent collectors describe this plant as a caespitose herb, the leaves "semi-glossy mid-green", in rosettes, forming large cushions, the inflorescence pale-green or purplish, and have encountered it in bogs, at 2550--3000 m. altitude. Van Royen (1979) lists it from Mounts Giluwe, Kenive, Kinkain, Amungwiwa,

Kerawa, Sarawaket, Scratchley, Pjora, Wilhelm, and Suckling, the Neon Basin, and Iswan Swamp, remarking that it usually occurs "on wet spots in the alpine grasslands or on boulder-strewn slopes", at 3150--4000 m. altitude, in both flower and fruit from January to July. He lists the native name, "kuk", for it. He has designated the unnumbered Giulianetti collection in the Leiden herbarium as the type (holotype).

Additional citations: NEW GUINEA: Papua: Croft & al. LAE.65250 (E--2473570); Croft & Hope LAE.65932 (Ld, W--2895095); Stevens & Veldkamp LAE.54906(W--2929647). MOUNTED ILLUSTRATIONS: Van Royen, Alpine Fl. N. Guin. 2: fig. 283 G--. 1979 (Ld) and pl. 95. 1979 (Ld).

ERIOCAULON MUTATUM N. E. Br.

Additional bibliography: Mold., Phytologia 34: 405. 1976; Mold., Phytol. Mem. 2: 224, 226, 233, 235, 237, 250, 400, & 602. 1980.

ERIOCAULON NAKASIMANUM Satake

Additional bibliography: Mold., Phytologia 29: 210. 1974; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON NAKASIMANUM var. SUPERANS Satake

Additional bibliography: Mold., Phytologia 24: 481. 1972; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON NAKAYENSE T. Koyama

Additional bibliography: Mold., Phytologia 24: 481. 1972; Mold., Phytol. Mem. 2: 285 & 602. 1980.

ERIOCAULON NANELLUM Ohwi

Additional bibliography: Mold., Phytologia 36: 484. 1977; Mold., 290, 301, & 602. 1980.

Additional citations: MOUNTED CLIPPINGS: Ohwi, Bot. Mag. Tokyo 44: 566. 1930 (W).

ERIOCAULON NANELLUM var. ALBESCENS Satake

Additional bibliography: Mold., Phytologia 24: 481. 1972; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON NANELLUM var. FILAMENTOSUM (Satake) Satake

Additional bibliography: Mold., Phytologia 24: 481--482. 1972; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON NANELLUM var. PILIFERUM Satake

Additional bibliography: Mold., Phytologia 36: 484. 1977; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON NANTOENSE Hayata

Additional synonymy: Eriocaulon nantoense var. nantoense [Hayata] apud Chang, Fl. Taiwan 5: 185. 1978. Eriocaulon nantoense

Hayata ex Mold., Phytologia 52: 128, in syn. 1982.

Additional bibliography: Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Huang, Taiwania 15: 152. 1970; Mold., Phytologia 34: 405. 1976; Chang, Fl. Taiwan 5: [179] & 185--187, pl. 1316. 1978; Mold., Phytol. Mem. 2: 301, 304, 310, 402, & 602. 1980.

Additional illustrations: Chang, Fl. Taiwan 5: 186, pl. 1316. 1978.

Chang (1978) asserts that this species is endemic to Taiwan where it is often found in shallow pools in the central and northern regions of the island. He cites Kawakami 1913 (the type collection), Nakai 4221, and Suzuki 6716. It has been found in flower and fruit in April and November, in flower only in October. Huang (1970) describes its pollen grains as 21--25 μ wide on the basis of Nakamura 4221 from Taiwan.

Additional citations: TAIWAN: Koyama & Kuo 8610 (N); Suzuki 6644 (Mi); Yamamoto & Mori s.n. [Nov. 2, 1932] (Mi). MOUNTED ILLUSTRATIONS: Chang, Fl. Taiwan 5: 186, pl. 1316. 1978 (Ld).

ERIOCAULON NANUM R. Br.

Additional bibliography: Mold., Phytologia 41: 427 & 458. 1979; Mold., Phytol. Mem. 2: 336 & 602. 1980.

ERIOCAULON NASUENSE Satake

Additional bibliography: Mold., Phytologia 29: 210. 1974; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON NAUTILIFORME H. Lecomte

Additional bibliography: H. Lecomte, Notul. System. 1: 188. 1909; Höck, Justs Bot. Jahresber. 39 (1): 1016. 1913; Fedde, Justs Bot. Jahresber. 39 (2): 1387. 1916; Mold., Phytologia 26: 31. 1973; Mold., Phytol. Mem. 2: 288, 290, 292, & 602. 1980.

Lecomte (1909) cites for this species only unnumbered Geoffray and Lecomte & Finet collections from Cambodia, of Pierre from Cochinchina, and of Thorel from Laos.

Additional citations: MOUNTED CLIPPINGS: H. Lecomte, Journ. Bot. Morot. 21: 105. 1908 (W).

ERIOCAULON NEESTIANUM Körn.

Additional bibliography: Mold., Phytologia 29: 210--211 & 234. 1974; Mold., Phytol. Mem. 2: 268 & 602. 1980.

Additional citations: MOUNTED CLIPPINGS: Körn., Linnaea 27: 628. 1854 (W).

ERIOCAULON NEGLECTUM Ruhl.

Additional bibliography: Mold., Phytologia 32: 502 (1976) and 37: 77. 1977; Mold., Phytol. Mem. 2: 142 & 602. 1980.

ERIOCAULON NEO-CALEDONICUM Schlecht.

Additional bibliography: Mold., Phytologia 36: 484. 1977;

Mold., *Phytol. Mem.* 2: 331 & 602. 1980.

ERIOCAULON NEPALENSE Prescott

Additional synonymy: *Eriocaulon nepalense* "Presc. ex Bong."
apud Worsdell, *Ind. Lond. Suppl.* 1: 376. 1941.

Additional & amended bibliography: *Fyson, Journ. Indian Bot.* 2: 198. pl. 6. 1921; *Fyson, Indian Sp. Erioc. pl. 6.* 1923; *Worsdell, Ind. Lond. Suppl. 1:* 376. 1941; *Mold., Phytologia* 36: 485. 1977; *Mold., Phytol. Mem.* 2: 301 & 602. 1980.

Additional illustrations: *Fyson, Indian Sp. Erioc. pl. 6.* 1923.

Additional citations: MOUNTED CLIPPINGS: *Körn., Linnæa* 27: 637. 1854 (W).

ERIOCAULON NEPALENSE var. **LAOSENSE** Satake

Synonymy: *Eriocaulon nanellum* var. *laosense* Satake ex Mold.,
Phytol. Mem. 2: 290 & 602, sphalm. 1980.

Additional bibliography: *Mold., Phytologia* 36: 485. 1977; *Mold., Phytol. Mem.* 2: 602. 1980.

ERIOCAULON NIGERICUM Maikle

Additional bibliography: *Anon., Kew Bull. Gen. Ind.* 111. 1959; *Mold., Phytologia* 41: 427--428. 1979; *Mold., Phytol. Mem.* 2: 200, 205, 207--209, 212, & 602. 1980.

ERIOCAULON NIGRICEPS Merr.

Additional bibliography: *Mold., Phytologia* 24: 483 (1972) and 34: 403. 1976; *Mold., Phytol. Mem.* 2: 307 & 602. 1980.

Jacobs refers to this plant as "tufted in open marshy places in elfin forests with scattered grassy clearings free from regular fires" and describes the inflorescences as "blackish".

Additional citations: PHILIPPINE ISLANDS: Luzon: Jacobs 7451 (E--2368312).

ERIOCAULON NIGRUM H. Lecomte

Additional bibliography: *Mold., Phytologia* 34: 405. 1976; *Mold., Phytol. Mem.* 2: 28, 292, & 602. 1980.

Lecomte (1912) cites for this species only unnumbered collections of Balansa and of Bon from Tonkin, Vietnam. Hennipman has encountered what may be this plant in a forest along a streamlet in Thailand, in both flower and fruit in January.

Additional citations: THAILAND: Hennipman 3651a (Ac, Ld).

ERIOCAULON NIGRUM var. **FUSCESCENS** T. Koyama

Additional bibliography: *Mold., Phytologia* 24: 483. 1972; *Mold., Phytol. Mem.* 2: 292 & 602. 1980.

ERIOCAULON NILAGIRENSE Steud.

Additional bibliography: *Mold., Phytologia* 41: 428. 1979; *Mold., Phytol. Mem.* 2: 262, 268, 272, 278, & 602. 1980; *Mold., Phytologia* 50: 252 (1982) and 53: 276. 1983.

Recent collectors describe this plant as a caespitose herb, 30

cm. tall, with white flower-heads, and have found it growing in swampy meadows, on streambanks, in boggy pastures, in loamy soil "in anthropogenous, marshy, regularly burned grassland", at 850--2000 m. altitude, in flower in October and in both flower and fruit in May. Bernardi notes that it is "conspicuous at 1000 m." in Sri Lanka (where my wife and I also observed it to be quite abundant in patana). Sinclair reports it "rare" in mountain streams in Travancore.

The Jarrett & Ramamoorthy HFP.1034 collection appears to represent an almost subglabrous form.

Material of this species has been misidentified and distributed in at least some herbaria as E. robusto-brownianum Ruhl.

Additional citations: INDIA: Karnataka: Jarrett & Ramamoorthy HFP.995 (Mi), 1034 (Mi); Saldanha & Ramamoorthy HFP.1142 (Mi). Kerala: J. Sinclair 3600 (W--2918904). SRI LANKA: Bernardi 15768 (W--2908152), 16094 (E--2906609); Huber 483 (W--2891117); Sohmer & Sumithraarachchi 9922 (E--2581975), 10014 (E--2582877), 10141 (E--2576244); Sohmer & Waas 8699 (E--2266793); Sumithraarachchi DBS.939 (W--2915608). CHINA: Yunnan: Forrest 12002 (Ba). THAILAND: Geesink, Hattink, & Phengklai 7048 (Ac).

ERIOCAULON NILAGIRENSE f. PARVIFOLIUM Mold.

Additional bibliography: Mold., Phytologia 41: 428. 1979; Mold., Phytol. Mem. 2: 262, 268, & 602. 1980.

Recent collectors merely refer to this plant as an herb with white "flowers" and have encountered it in marshes, at 7000 feet altitude.

Additional citations: INDIA: Tamil Nadu: Koelz 11007 (Mu).

ERIOCAULON NIPPONICUM Maxim.

Additional bibliography: Mak., Ill. Fl. Jap. [724]. 1924; Ishidoya, Chines. Drog. 1: 16. 1933; Terasaki, Nipp. Shokubutsu Zufu [Jap. Bot. Illust. Album] 1846; Mak., Illust. Fl. Nipp. 771, fig. 2313. 1940; Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Mold., Phytologia 34: 264, 394, 404, 406, & 492. 1976; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 148. 1979; Mold., Phytol. Mem. 2: 198, 278, 299, 301, & 602. 1980.

Additional illustrations: Mak., Ill. Fl. Jap. [724]. 1924; Ishidoya, Chines. Drog. 1: 16. 1933; Terasaki, Nipp. Shokubutsu Zufu [Jap. Bot. Illust. Album] 1846. 1933; Mak., Illust. Fl. Nipp. 771, fig. 2313. 1940.

Material of E. nipponicum has been misidentified in distributed in some herbaria as E. miquelianum Körn.

Additional citations: KOREA: Oh 85 (Ba--381693). MOUNTED ILLUSTRATIONS: Mak., Illust. Fl. Nipp. 771, fig. 2313. 1940 (Ld).

ERIOCAULON NIPPONICUM var. GLABERRIMUM Satake

Additional bibliography: Mold., Phytologia 24: 484. 1972; Mold., Phytol. Mem. 2: 301 & 602. 1980.

ERIOCAULON NOSORIENSE Ohwi

Additional bibliography: Mold., *Phytologia* 26: 32. 1973; Mold., *Phytol. Mem.* 2: 301 & 602. 1980.

Additional citations: MOUNTED CLIPPINGS: Ohwi, *Bot. Mag. Tokyo* 44: 567. 1930 (W).

ERIOCAULON NOVOGUINEENSE Van Royen

Additional bibliography: Mold., *Phytologia* 36: 485. 1977; Van Royen, *Alpine Fl. N. Guin.* 2: 825, 840, & 841, fig. 285 A--EE. 1979; Mold., *Phytol. Mem.* 2: 326 & 602. 1980; Mold., *Phytologia* 53: 267 & 273. 1983.

Additional illustrations: Van Royen, *Alpine Fl. N. Guin.* 2: 841, fig. 285 A--EE. 1979.

Van Royen (1979) says that this plant grows at the edges of lakes and on marshy slopes in montane to alpine grasslands, at 2590--3680 m. altitude, in both flower and fruit from February to August in both Papua and the Territory of New Guinea. He records the vernacular name, "pehndigi".

Additional citations: MOUNTED ILLUSTRATIONS: Van Royen, *Alpine Fl. N. Guin.* 2: 841, fig. 285 A--EE. 1979 (Ld).

ERIOCAULON NUDICUSPE Maxim.

Additional bibliography: Mak., *Ill. Fl. Jap.* [723]. 1924; Worsdell, *Ind. Lond. Suppl.* 1: 376. 1941; Mold., *Phytologia* 34: 396 & 406. 1976; Mold., *Phytol. Mem.* 2: 301 & 602. 1980.

Additional illustrations: Mak., *Ill. Fl. Jap.* [723]. 1924.

Additional citations: JAPAN: Honshu: Inami 956 (Mi). MOUNTED ILLUSTRATIONS: Mak., *Illust. Fl. Nipp.* 772, fig. 2316. 1940 (Ld).

ERIOCAULON OBCLAVATUM Satake

Additional bibliography: Mold., *Phytologia* 24: 484--485. 1972; Mold., *Phytol. Mem.* 2: 257 & 602. 1980.

ERIOCAULON OBTUSUM Ruhl.

Additional bibliography: Mold., *Phytologia* 24: 485. 1972; Mold., *Phytol. Mem.* 2: 142 & 602. 1980.

ERIOCAULON OCTANGULARE Blume, *Cat. Gewass. Buitenz.*, imp. 1, 35, nom. nud. 1823.

Bibliography: Blume, *Cat. Gewass. Buitenz.*, imp. 1, 35 (1823) and imp. 2, 35. 1946; Mold., *Phytologia* 50: 253. 1982.

Nothing is known to me of this plant whose vernacular name is said by Blume to be "manjil". Presumably it is one of the native Javan species.

ERIOCAULON ODASHIMAI Masemune

Additional bibliography: Mold., *Phytologia* 24: 485. 1972; Mold., *Phytol. Mem.* 2: 281 & 602. 1980.

ERIOCAULON ODORATUM Dalz.

Additional bibliography: Fyson, *Indian Sp. Erioc.* pl. 24. 1923; Worsdell, *Ind. Lond. Suppl.* 1: 376. 1941; Bennet, *Fl. How-*

rah 99 & 100. 1976; Hocking, Excerpt. Bot. A.31: 17. 1978; Holm, Pancho, Herberger, & Plucknett, Geogr. Atlas World Weeds 148. 1979; Mold., Phytologia 41: 428. 1979; Mold., Phytol. Mem. 2: 262, 270, 285, 288, 290, 402, & 603. 1980.

Additional illustrations: Fyson, Indian Sp. Erioc. pl. 24. 1923.

Recent collectors report finding this plant in open fields, in both flower and fruit in February. Bennet (1976) asserts that it grows "In moist harvested fields without water or with a very thin layer of water". He refers to it as "rare", flowering from September to November in West Bengal.

Additional citations: THAILAND: Koyama, Phengkklai, Niyondham, Tamura, Okada, & O'Connor 15481 (N). MOUNTED CLIPPINGS: Dalz., Journ. Bot. Kew Misc. 3: 280. 1851 (W).

ERIOCAULON OFFICINALE Körn.

Additional bibliography: Mold., Phytologia 24: 485. 1972; Mold., Phytol. Mem. 2: 278 & 603. 1980.

ERIOCAULON OLIVACEUM Mold.

Additional bibliography: Mold., Phytologia 36: 486. 1977; Mold., Phytol. Mem. 2: 91 & 603. 1980.

ERIOCAULON OLIVERI Fyson

Additional bibliography: Mold., Phytologia 41: 428. 1979; Mold., Phytol. Mem. 2: 266 & 603. 1980.

Additional citations: MOUNTED CLIPPINGS: Fyson, Kew Bull. Misc. Inf. 1914: 331. 1914 (W).

ERIOCAULON OMURANUM T. Koyama

Additional bibliography: Mold., Phytologia 24: 485. 1972; Mold., Phytol. Mem. 2: 301 & 603. 1980.

ERIOCAULON OREADUM Van Royen

Additional bibliography: Mold., Phytologia 34: 486. 1976; Mold., Phytol. Mem. 2: 326 & 603. 1980.

Recent collectors refer to this plant as an herb growing in small clumps, 10 cm. tall, the leaves "mid-pale-green" and the inflorescences whitish, and have found it growing at 2550 m. altitude, in both flower and fruit in May.

Additional citations: NEW GUINEA: Territory of New Guinea: Stevens & Veldkamp LAE.54904 (W--2929646).

ERIOCAULON ORYZETORUM Mart.

Additional bibliography: Fyson, Indian Sp. Erioc. pl. 32. 1923; Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Mold., Phytologia 41: 428. 1979; Mold., Phytol. Mem. 2: 257, 262, 272, 285, 289, 292, & 603. 1980; Mold., Phytologia 50: 255 (1982) and 53: 265. 1983.

Additional illustrations: Fyson, Indian Sp. Erioc. pl. 32. 1923.

The Bogner collection, cited below, was grown from seed imported from Singapore.

Lecomte (1912) cites for this species only unnumbered collections of Lecomte & Finet from Annam and Cambodia and of Thorel from Cochinchina.

The Niyondham & al. 107, distributed as E. oryzetorum, actually is E. achiton Körn.

Additional citations: CULTIVATED: Germany: Boegner 1533 (Ld).

ERIOCAULON OVOIDEUM Britton & Small

Additional bibliography: Mold., Phytologia 36: 486. 1977; Mold., Phytol. Mem. 2: 89, 91, & 603. 1980.

ERIOCAULON OZENSE T. Kiyama

Additional bibliography: Mold., Phytologia 24: 486. 1972; Mold., Phytol. Mem. 2: 301 & 603. 1980; Hara in Ozegahara, Scient. Res. Highmoor 132. 1982.

Additional citations: MOUNTED ILLUSTRATIONS: T. Koyama, Journ. Jap. Bot. 31: 6, fig. 1. 1956 (W).

ERIOCAULON PACHYSTROMA Van Royen

Additional bibliography: Mold., Phytologia 24: 486. 1972; Mold., Phytol. Mem. 2: 314 & 603. 1980.

ERIOCAULON PALLESCENS (Nakai) Satake

Additional bibliography: Mold., Phytologia 26: 32. 1973; Mold., Phytol. Mem. 2: 301 & 603. 1980.

ERIOCAULON PALLIDUM R. Br.

Additional bibliography: Mold., Phytologia 24: 486--487. 1972; Mold., Phytol. Mem. 2: 336 & 603. 1980.

ERIOCAULON PALLUDICOLA Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: 160, pl. 2. 1921.

Additional & emended bibliography: Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: 160, pl. 2. 1921; Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Mold., Phytologia 29: 213. 1974; Mold., Phytol. Mem. 2: 142 & 603. 1980.

Additional illustrations: Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: pl. 2. 1921.

The original spelling of the specific epithet of this taxon, as given at the head of the original description, is "palludicola", although it is spelled "paludicola" under the accompanying illustration.

Additional citations: MOUNTED ILLUSTRATIONS: Alv. Silv., Arch. Mus. Nac. Rio Jan. 23: pl. 2. 1921 (Ld); Alv. Silv., Fl. Mont. pl. 3. 1928 (Ld).

ERIOCAULON PALMERI Ruhl.

Additional bibliography: Mold., Phytologia 32: 504. 1976; Mold., Phytol. Mem. 2: 62 & 603. 1980.

ERIOCAULON PALUSTRE Salzm.

Additional bibliography: Mold., Phytologia 24: 487. 1972; Mold.,

Phytol. Mem. 2: 142 & 603. 1980.

The Santos & Mattos Silva collection, cited below, comprises plants which are much larger in stature than those seen on the type collection, but appear to possess the same essential characters. The collectors describe the plants as to 20 cm. tall, the leaves fleshy, and the inflorescences ashy, and found it both in flower and fruit in July.

Additional citations: BRAZIL: Bahia: Santos & Mattos Silva 3265 (Ld).

ERIOCAULON PANAMENSE Mold.

Additional bibliography: Mold., Phytologia 32: 504. 1976; Mold., Phytol. Mem. 2: 83 & 603. 1980.

ERIOCAULON PANCHERI H. Lecomte

Additional bibliography: Mold., Phytologia 41: 428. 1979; Mold., Phytol. Mem. 2: 331 & 603. 1980.

ERIOCAULON PAPILLOSUM Körn.

Additional bibliography: Mold., Phytologia 24: 487. 1972; Mold., Phytol. Mem. 2: 142 & 603. 1980.

ERIOCAULON PAPUANUM Van Royen

Additional bibliography: Mold., Phytologia 24: 487. 1972; Mold., Phytol. Mem. 2: 326 & 603. 1980.

ERIOCAULON PARADOXUM Mold.

Additional bibliography: Mold., Phytologia 24: 488. 1972; Mold., Phytol. Mem. 2: 62 & 603. 1980.

ERIOCAULON PARAGUAYENSE Körn.

Additional bibliography: Mold., Phytologia 36: 486/ 1977; Mold., Phytol. Mem. 2: 142 & 603. 1980.

ERIOCAULON PARKERI B. L. Robinson

Additional bibliography: Worsdell, Ind. Lond. Suppl. 1: 376. 1941; Kral in Godfrey & Wooten, Aquat. Wetl. Pl. SE. U. S. 504, 518, & 519, fig. 301. 1979; Mold., Phytologia 41: 428--429 & 454. 1979; Wherry, Fogg, & Wahl, Atlas Fl. Penna. 93. 1979; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 197. 1980; Mold., Phytol. Mem. 2: 9--14, 16, & 603. 1980; F. C. Seymour, Phytol. Mem. 5: 171. 1981; Snyder & Vivian, Rare Endang. Vasc. Pl. Sp. N. J. 23 & 97. 1981; Mold., Phytologia 50: 455 (1982) and 52: 111. 1982.

Additional illustrations: Kral in Godfrey & Wooten, Aquat. Wetl. Pl. SE. U. S. 519, fig. 301. 1979.

Seymour (1981) refers to this plant as "Rare" in the tidal mud-flats of rivers in New England. Snyder & Vivian (1981) list it from Atlantic, Burlington, Camden, Cumberland, Gloucester, Monmouth, Ocean, and Salem Counties, New Jersey, where, they say, it occurs "In shallow water of estuaries and muddy tidal flats. Local and rare throughout its range in the U. S. Vulnerable and declining due to destruction and pollution of its habitat."

Additional citations: QUEBEC: Québec Co.: Clausen & Trapido 2779 (It). MAINE: Penobscot Co.: Fernald & Long 13166 (It); Laubengayer & Quimby s.n. [August 22, 1937] (It). Sagadahoc Co.: Fernald & Long, Pl. Exsicc. Gray. 174 (It). County undetermined: Kendall s.n. [June 9, 1899] (W-26558). NEW YORK: Dutchess Co.: Muenschner & Curtis 5602 (It). Greene Co.: Muenschner & Curtis 5604 (It), 5605 (It). Orange Co.: Muenschner & Curtis 5599 (It). Ulster Co.: Muenschner & Curtis 5603 (It), 5606 [N. Y. Aquat. Pl. seed 138] (It), 5606a (It), 5606b (It). Iona Island: Muenschner & Curtis 5598 (It). Rogers Island: Muenschner & Curtis 5600 (It), 5601 (It). NEW JERSEY: Burlington Co.: Blaser 234 (It); Dix s.n. [9/24/44] (It). Camden Co.: Pennell 12006 (It). Monmouth Co.: Edwards & Clausen 1419 (It); Gershoy 207 (It); Thorne 1034 (It). Ocean Co.: Thorne 1192 (It). PENNSYLVANIA: Bucks Co.: Dreisbach 4382 (Mi), 4541 (Mi). Lancaster Co.: Heller & Halbach s.n. [September 12, 1891] (It). MARYLAND: Cecil Co.: Blake 9694 (It). Worcester Co.: Edwards s.n. [Oct. 19, 1938] (It). NORTH CAROLINA: Tyrrell Co.: Radford 44454 (Mi).

ERIOCAULON PARVICAPITULATUM Mold.

Additional bibliography: Mold., *Phytologia* 24: 489. 1972; Mold., *Phytol. Mem.* 2: 250 & 603. 1980.

ERIOCAULON PARVUM Körn.

Additional bibliography: Mold., *Phytologia* 34: 486. 1976; Mold., *Phytol. Mem.* 2: 299, 301, & 603. 1980.

ERIOCAULON PECTINATUM Ruhl.

Additional bibliography: Mold., *Phytologia* 24: 489. 1972; Mold., *Phytol. Mem.* 2: 262 & 603. 1980.

ERIOCAULON PELLUCIDUM Michx.

Additional & amended bibliography: Raf., *Atl. Journ.*, imp. 1, 121. 1832; J. C. Willis, *Dict. Flow. Pl.*, ed. 2, 368 (1903) and ed. 3, 378. 1908; Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 706--709 & 964, fig. 481 & 482. 1911; J. C. Willis, *Dict. Flow. Pl.*, ed. 5, 251 (1925) and ed. 6, imp. 1, 251. 1931; Solomon, *Hourn. Indian Bot. Soc.* 10: 139--144. 1931; Raf., *Autikon Bot.*, imp. 2, 189. 1942; A. C. Martin, *Am. Midl. Nat.* 36: 523, 533, 652, 654, & 659. 1946; Raf., *Atl. Journ.*, imp. 2, 121. 1946; J. C. Willis, *Dict. Flow. Pl.*, ed. 6, imp. 2, 251 (1948) and ed. 6, imp. 3, 251. 1951; Kapp, *How Know Pollen Spores* 92 & 222, fig. 182. 1969; Napp-Zinn, *Anat. Blatt. A* (1): 555. 1974; Latorre, Ortega, & Inca, *Cienc. Naturaleza* 18: 62. 1977; Haslam, *River Pl.* 287. 1978; Johnson & Fowles, *Heritage Me. Wild Fls.* 66, 67, & 226. 1978; Monteiro-Scanavacca & Mazzoni, *Revist. Bras. Bot.* 1: [59] & 63. 1978; Kral in Godfrey & Wooten, *Aquat. Wetl. Pl. SE. U. S.* 504, 513--515, & 518, fig. 298. 1979; Mold., *Phytologia* 41: 429--430, 454, & 457 (1979), 43: 222 (1979), and 44: 123. 1979; Monteiro, Giulietti, Mazzoni, & Castro, *Bol. Bot. Univ. S. Paulo* 7: 49. 1979; Pursh, *Fl. Amer. Sept.*, imp. 2 [ed. Ewan], 92. 1979; Wherry, Fogg, &

Wahl, Atlas Fl. Penna. 93. 1979; Zander & Pierce, Bull. Buffalo Soc. Nat. Sci. 16 (Suppl. 2): 40 & 92. 1979; Campbell & Eastman, Fl. Oxford Co. 93--94. 1980; J. T. & R. Kartesz, Syn. Checklist Vasc. Fl. 2: 197. 1980; Mold., Phytol. Mem. 2: 8--14, 16, 27, 29, 33--35, 301, 368, 402--404, & 603. 1980; Prescott, How Know Aquat. Pl., ed. 2, 126, fig. 146. 1980; Foote, Phytologia 50: 24. 1981; A. Löve, Taxon 30: 515. 1981; Munz & Slauson, Ind. Illustr. Living Things Outside N. Am. 219 & 351. 1981; F. C. Seymour, Phytol. Mem. 5: 171. 1981; Mold., Phytologia 50: 233 & 235 (1982), 52: 110 & 113 (1982), and 53: 282 & 283. 1983.

Additional illustrations: Lotsy, Vortr. Bot. Stammesges. 3 (1): 708 & 709, fig. 481 & 482. 1911; Kapp, How Know Pollen Spores 92, fig. 182. 1969; Johnson & Fowles, Heritage Me. Wild Fls. 67 (in color). 1978; Kral in Godfrey & Wooten, Aquat. Wetl. Pl. SE. U. S. 514, fig. 298. 1979; Prescott, How Know Aquat. Pl., ed. 2, 126, fig. 146. 1980.

It is worth noting here that modern geologists believe that North America and Europe began breaking apart and separating, with the Atlantic Ocean intervening, about 65,000,000 years ago, in the Cretaceous or soon after flowering plants were evolved. It would seem, therefore, that a sufficient lapse of time has occurred to lend support to the belief that the American and European populations are now quite separate taxa, if not of specific, then surely of subspecific or varietal rank, especially in view of their reported different genetic constitution.

Kapp (1969) says of the pollen of this species: "Size: 34--35 mu diameter.....The spiral furrows of Eriocaulon, and related structures on other monocots, have been interpreted as spiral endocracks. They resemble, but may not be homologous with, spiral apertures in dicotyledonous pollen grains. In E. septangulare the exine strips are 8--10 mu wide; the spinules are 1.5--2 mu apart." It would be very interesting to compare this description with the pollen grains of the very closely related European E. aquaticum (J. Hill) Druce."

The Harvey s.n., St. John 1168, and Tuckerman s.n., previously cited by me as typical E. pellucidum, are now regarded as representing f. pumilum (Ref.) Mold.

In this connection it is worth noting how Rafinesque distinguishes his taxa from typical E. pellucidum: for E. pellucidum he says "Canada, Alleghenies, New Jersey, leaves 1--2 inches, scape 3 to 6, scales often fuscate, fl. grey". For E. pumilum [later var. pumilum] he says "Leaves subulate recurved pellucid acute, convex and striated outside, flat inside. Scape stiff double than leaves, spirally striated. Capitule hemispherical, scales black obovate obtuse. -- Annual like all the Sp. On the Catskil or Kiskomon mts of New York, on the margin of the two lakes, only one inch high. Flowers estival. tricolor, base green, middle brown, top nearly white". For E. brevifolium he says "fol. subul. brevissimis acutis, scapo elong. gracilis contorto sulcato, basi vaginato, capit. globosis, bract. ovat. acut. glabris fulvis -- South. New Jersey and Texas, leaves un-

cial or less, scape 5 to 8 inches few ribs, heads small, fl. gray." It seems plain that the present E. texense Körn. is included in his description of E. brevifolium.

Löve (1981) lists the chromosome number for E. pellucidum as $n = 10$ on the basis of Harriman 16695 from Waushara County, Wisconsin, and Parfitt 2880 from Langlade County, Wisconsin.

Garton refers to this plant as "emergent through dessication and in water to 2 dm. deep in peaty silt along lakeshores" in Ontario. Dirig & Cryan found it at the edges of sandy-bottomed kettle lakes at 2500 feet altitude in New York. Fernald, Long, & Dunbar found it in bog-barren ponds in Newfoundland; Fernald & Long in stream deadwaters in Maine. In Quebec it is often found in association with Lobelia dortmanna; in Newfoundland it has been encountered at 380 m. altitude.

Material of E. pellucidum, in the southernmost areas of its natural range, is sometimes misidentified and distributed in herbaria as E. compressum Lam. On the other hand, the Blaser 28, Knieskern s.n., and St. John 1855, distributed as E. pellucidum, actually are E. compressum Lam., Muenscher 3649 is E. decangulare var. minor Mold., Thorne 3957, 4696, 5022, 6551, & 7030, Thorne & Muenscher 8994, and Wiegand & Manning 681 are E. lineare Small, and Gershoy 207, Heller & Halbach s.n. [September 13, 1891], Radford 44454, and Thorne 1034 & 1192 are E. parkeri B. L. Robinson.

Additional citations: NEWFOUNDLAND: Fernald, Long, & Dunbar 26459 (It), 26460 (It); Fernald & Wiegand 5068 (It); Fernald, Wiegand, & Kittredge 2970 (It), 2971 (It), 5069 (It). NOVA SCOTIA: Cape Sable Island: Macoun 22639 (It); St. John 1168 (It). QUEBEC: Gaspé Co.: Marie-Victorin, Rolland-Germain, & Jacques 44547 (It). Gatineau Co.: Senn 1860 (It). Portneuf Co.: Greenough s.n. [Sept. 20, 1891] (It). Séquenay Co.: H. F. Lewis s.n. [Aug. 31, 1928] (It). ONTARIO: Haliburton Distr.: Wright & Wright s.n. [July-Sept. 1913] (It). Leith Township: Zenkert s.n. [Sept. 4, 1929] (It). Nipissing Dist.: Riley & Lindsay 12052 (Mi). Perry Sound Distr.: Freer 70 [Herb. Univ. Toronto 828] (It); McDonald 313 (It). Rainy River Dist.: Garton 19062 (Mi). Nipigon Prov. Forest: Clamens 67 (It). Thessalon: DePoe & DePoe 7763 (Ne--77380, Ne--86162). MAINE: Penobscot Co.: Cochrane s.n. [East Corinth, July 28, 1880] (N, N); Laubengayer & Quimby s.n. [August 24, 1937] (It); Perkins s.n. [July 23, 1935] (It). Waldo Co.: Fernald & Long 13162 (It). York Co.: Muenscher s.n. [June 24, 1941] (It). NEW HAMPSHIRE: Carroll Co.: Hellquist 11012 (Ne--118608); Whiting s.n. [Lake Winnepissauque] (It). Grafton Co.: Schrank s.n. [Squam Lake, Aug. '91] (It). VERMONT: Addison Co.: M. Hitchcock 3018 (N). Franklin Co.: Muenscher, Manning, & McGuire 312 (It). Orange Co.: Rodman s.n. [Aug. 15, 1913] (It). MASSACHUSETTS: Barnstable Co.: Dean s.n. [September 27, 1915] (It, It); Fames s.n. [September 8, 1926] (It); W. H. Lewis s.n. [June-July 1908] (N). Berkshire Co.: Townsend s.n. [Aug. 16, 1896] (It). Hampden Co.: Shurtleff s.n. [Southwick Pond, 1858]

(N). Middlesex Co.: Dean s.n. [Oct. 7, 1917] (It); Eames s.n. [Sept. 5, 1913] (It); Mann s.n. [Concord] (It); A. H. Moore 3219 in part (It). Plymouth Co.: Fogg 3818 (It); Whiting s.n. [Aug. 31, 1849] (It). Suffolk Co.: McAtee 1085 (W--568757). Grand Manan Island: Rothrock s.n. (It). Martha's Vineyard Island: C. C. Curtis s.n. [VIII-12-1892] (It); Perkins s.n. [July 16, 1930] (It); Sheldon s.n. [July 28, 1879] (It). RHODE ISLAND: Providence Co.: E. J. Palmer 47380 (Ne--145423). CONNECTICUT: Litchfield Co.: Curtice s.n. [July 1880] (It). New Haven Co.: Averill s.n. [1879] (It). New London Co.: S. R. Hill 9462 (N); Stearns s.n. [East Lyme, August 1902] (N). Windham Co.: G. A. Petersen s.n. [July 1924] (It). NEW YORK: Albany Co.: Collector undetermined s.n. [Sand Lake] (N). Chautauque Co.: McVaugh & Curtis 7236 (It). Clinton Co.: Muenschner, Manning, & Maguire 311 (It). Cortland Co.: Muenschner 19365 (It). Delaware Co.: Dirig & Cryan s.n. [4 Sept. 1977] (Ba, Ba, Ba, Ba). Essex Co.: Muenschner & Brown 21101 (It), 21102 (It); Muenschner & Lindsey 3142 [Seeds N. Y. Aquat. Pl. 64] (It), 3145 (It); Muenschner & Maguire 2118 (It); Muenschner, Manning, & Maguire 307 (It). Franklin Co.: Muenschner & Maguire 1042 (It), 1043 (It), 1043a (It); Muenschner, Manning, & Maguire 308 (It), 309 (It); Rowlee, Wiegand, & Hastings s.n. [July 1, 1899] (It). Fulton Co.: House 9607 (It); Muenschner & Clausen 4442 (It), 4443 (It). Hamilton Co.: Eames & McDaniels 6131 (It); Muenschner & Clausen 3864 (It); Muenschner & Lindsey 3143 (It), 3147 (It); Wiegand 16487 (It); A. H. Wright 11723 (It). Herkimer Co.: Muenschner & Maguire 2117 (It), 2119 (It). Jefferson Co.: Fernald, Wiegand, & Eames 14205 (It). Nassau Co.: Gershoy 386 (It); Muenschner & Curtis 6806 (It), 6807 (It), 6808 (It), 6809 (It). Onondaga Co.: Muenschner & Brown 21667 (It). Oneida Co.: Wiegand 6130 (It). Orange Co.: Koster s.n. [Muenschner & Curtis 5609] (It); Muenschner & Curtis 5607 (It). Oswego Co.: Clausen & Hinkley 4382 (It), 4383 (It); Fernald, Wiegand & Eames 14204 (It); Kilborne s.n. [7-24-78] (It); Rowlee s.n. [Scriba, 8-4-91] (It), s.n. [Aug. 21, 1894] (It), s.n. [June 26, 1895] (It), s.n. [Sept. 5, 1906] (It); H. L. Stewart s.n. [Aug. 17, 1888] (It); Wiegand 13445 (It); Wiegand & Hoy s.n. [Sept. 11, 1897] (It). Putnam Co.: Muenschner & Curtis 5610 (It), 5612 (It). Rensselaer Co.: Cipperly s.n. [Sept. 5, 1903] (It); House 21951 (It); Muenschner & Clausen 4444 (It), 4445 (It). Rockland Co.: Muenschner & Curtis 5608 (It). Saint Lawrence Co.: Atkinson s.n. [Sept. 2, 1896] (It); Muenschner & Maguire 1040 (It), 1041 (It); Phelps 296 (It). Saratoga Co.: Denton s.n. [Aug. 1901] (It). Schuyler Co.: McVaugh & Curtis 7465 (It). Suffolk Co.: Gershoy s.n. [July 13, 1919] (It, It); Latham s.n. [Summer 1925] (It), s.n. [August 4, 1929] (It); Muenschner & Curtis 6810 (It), 6811 (It), 6812 (It), 6813 (It), 6814 (It), 6815 (It), 6816 (It), 6817 (It), 6818 (It); St. John 2622 (It); Schrenk s.n. [July 1895] (It); Schrenk & Stewart s.n. [Aug. 7, 1895] (It). Sullivan Co.: Muenschner &

Curtis 5023 (It), 5024 (It), 5025 (It). Ulster Co.: Barratt s.n. [near the Foundry, Highlands] (N). Warren Co.: Herb. Cornell Univ. s.n. (It); Metcalf & Wiegand 6132 (It); Rowlee, Wiegand, & Hastings s.n. [July 10, '99] (It, It); Wesley 1323 (Ba--389480). Washington Co.: Muenschner, Manning, & Maquire 314 (It). Westchester Co.: Muenschner & Curtis 5611 (It). NEW JERSEY: Atlantic Co.: Gershoy 206 (It). Bergen Co.: Clausen & Edwards 4097 (It). Morris Co.: Clausen & Clausen 1819 (It). Ocean Co.: Gleason, Smith, & Alexander 173 (It). Sussex Co.: Clausen & Edwards 2269 (It). PENNSYLVANIA: Wayne Co.: Clausen, Hinkey, & al. 4003 (It); Dix s.n. [Sept. 3, 1945] (It); Wahl 504 (It). VIRGINIA: Augusta Co.: Killip 32582 (It). NORTH CAROLINA: Tyrrell Co.: Musselman s.n. [11 September 1976] (Ne--128335). Washington Co.: Pence s.n. [Radford 45084] (Mi). GEORGIA: Decatur Co.: Thorne & Muenschner 8642 (It). Screven Co.: Miller & Maquire 410a (It). MICHIGAN: Alger Co.: Lyons 39122 (Mi); R. H. Read 142 (Mi). Baraga Co.: Voss 7676 (Mi). Berrien Co.: Medley s.n. [August 28, 1971] (Mi). Cass Co.: Umbach 7360 (It, Mi); Voss 8815 (Mi). Cheboygan Co.: J. S. Harper 72 (It). Houghton Co.: Pringle 408 (Mi). Kent Co.: Bazin 1702 (Mi); Cole 7871 [Herb. Grand Rap. Pub. Mus. 50095] (Mi), s.n. [Herb. Grand Rap. Pub. Mus. 50093 & 50094] (Mi). Keweenaw Co.: Lyons 39121 (Mi); L. Thomson 76-01 (Mi). Luce Co.: Voss 13652 (Mi). Marquette Co.: Pringle 391 (Mi). Presque Isle Co.: Clover & Hubbard 27818 (Ne--94878). Schoolcraft Co.: Hanson 630 (Mi). Van Buren Co.: Nieuwland s.n. [VIII/23/18] (It). WISCONSIN: Stockton Island: R. G. Koch 10016 (Ne--125193). MINNESOTA: Chisago Co.: B. C. Taylor 7891 (Mi). Cook Co.: Butters & Buell 474 (It). Saint Clair Co.: Moyle 2388 (It). LOCALITY OF COLLECTION UNDETERMINED: Barratt s.n. (N); Knight s.n. (N).

ERIOCAULON PELLUCIDUM f. *PUMILUM* (Raf.) Mold., *Phytologia* 44: 123. 1979.

Synonymy: *Eriocaulon pumilum* Raf., *Atl. Journ.*, imp. 1, 121. 1832 [not *E. pumilum* Afzel., 1856, nor "Afzel ex Körn.", 1880, nor N. E. Br., 1903, nor Chapm., 1959]. *Eriocaulon pellucidum* var. *pumilum* Raf., *Autikon Bot.*, imp. 1, 189. 1840.

Bibliography: Raf., *Atl. Journ.*, imp. 1, 121. 1832; Raf., *Autikon Bot.*, imp. 1, 189. 1840; Mold., *N. Am. Fl.* 19 (1): 24. 1937; Mold., *Phytologia* 1: 323. 1939; Mold. in *Lundell, Fl. Tex.* 3: 6. 1942; Raf., *Autikon Bot.*, imp. 2, 189. 1942; Mold., *Known Geogr. Distrib. Erioc.* 39. 1946; Raf., *Atl. Journ.*, imp. 2, 121. 1946; Mold., *Résumé* 291. 1959; Mold., *Phytologia* 18: 373. 1969; Mold., *Fifth Summ.* 2: 509. 1971; Mold., *Phytologia* 44: 123. 1979; Mold., *Phytol. Mem.* 2: 8, 9, 11, 12, 402, 403, & 603. 1980; Mold., *Phytologia* 50: 233 (1982) and 52: 110. 1982.

Although originally regarded by Rafinesque as a species, later as a variety, of montane habitats, it seems apparent now that this taxon is merely an extreme edaphic form, probably due to lack of water supply in the habitat, although St. John reports finding it

in the swampy edges of a freshwater pond and Riley encountered it in "open graminoid fen pools, pH 5.7, water temperature 22° C., depth 5--30 cm., peat depth over 3.85 m., the dominants being algae, Menyanthes trifoliata, and Carex limosa." Forms approaching this are sometimes found in the mud along lakeshores during a low water level period or season of drought. See under E. pellucidum (above) for Rafinesque's original description. The collections cited below may be taken to represent it, but there are many intermediate collections showing almost every gradation between f. pumilum and the typical E. pellucidum.

Citations: NOVA SCOTIA: Cape Sable Island: St. John 1168 (N, W--1104093). NEW BRUNSWICK: Westmoreland Co.: Roberts & Bateman 64-2534 (Mi). ONTARIO: Cochrane Dist.: J. L. Riley 10544 (Mi). Rainy River Dist.: Garton 19062 (Ne--172316). Maine: Penobscot Co.: Harvey s.n. [Orono 1884] (C). NEW JERSEY: Morris Co.: Tuckerman s.n. [Mountain Lakes] (T). VIRGINIA: Augusta Co.: Ramsey, Freer, & Ruska 7240 (Ne--53070).

ERIOCAULON PELLUCIDUM f. ROLLANDII (Rousseau) Mold., *Phytologia* 43: 222. 1979.

Synonymy: Eriocaulon rollandii Rousseau, *Bull. Jard. Bot.*

Brux. 27: 372. 1957. Eriocaulon septangulare f. rollandii (Rousseau) Lepage, *Naturaliste Canad.* 101: 928. 1974.

Bibliography: Rousseau, *Bull. Jard. Bot. Brux.* 27: 372. 1957; A. & D. Löve, *Bot. Notiser Lund* 111: 380 & 385. 1958; Mold., *Résumé* 424 & 483. 1959; Mold., *Résumé Suppl.* 1: [1]. 1959; G. Taylor, *Ind. Kew. Suppl.* 13: 52. 1966; Mold., *Phytologia* 18: 376, 377, & 447. 1960; Mold., *Fifth Summ.* 1: 14 (1971) and 2: 941. 1971; Mold., *Phytologia* 25: 69. 1972; Lepage, *Naturaliste Canad.* 101: 928. 1974; Krug, *Excerpt. Bot. A.* 26: 415. 1976; Mold., *Phytologia* 36: 488. 1977; Scoggin, *Fl. Canad.* 2: 459. 1978; Mold., *Phytologia* 41: 454 (1979) and 43: 222. 1979; Mold., *Phytol. Mem.* 2: 8, 403, & 603. 1980.

ERIOCAULON PERPLEXUM Satake & Hara

Additional bibliography: Mold., *Phytologia* 41: 430. 1979; Mold., *Phytol. Mem.* 2: 301, 402, & 603. 1980.

ERIOCAULON PERUVIANUM Ruhl.

Additional bibliography: Mold., *Phytologia* 34: 487 (1976) and 36: 72. 1977; Mold., *Phytol. Mem.* 2: 133 & 603. 1980.

ERIOCAULON PICTUM Fritsch

Additional bibliography: Mold., *Phytologia* 24: 491 (1972) and 38: 131. 1977; Mold., *Phytol. Mem.* 2: 233, 237, & 603. 1980.

ERIOCAULON PILGERI Ruhl.

Additional bibliography: Mold., *Phytologia* 26: 183. 1973; Mold., *Phytol. Mem.* 2: 142 & 603. 1980.

ERIOCAULON PILIFLORUM Ruhl.

Additional bibliography: Mold., *Phytologia* 24: 491. 1972; Mold., *Phytol. Mem.* 2: 250 & 603. 1980.

ERIOCAULON PILIPHORUM Satake

Additional bibliography: Mold., *Phytologia* 24: 491--492. 1972; Mold., *Phytol. Mem.* 2: 301 & 603. 1980.

ERIOCAULON PILOSISSIMUM Van Royen

Additional bibliography: Mold., *Phytologia* 24: 492. 1972; Mold., *Phytol. Mem.* 2: 314 & 603. 1980.

ERIOCAULON PINARENSE Ruhl.

Additional bibliography: Mold., *Phytologia* 36: 487. 1977; Mold., *Phytol. Mem.* 2: 89, 91, & 603. 1980.

ERIOCAULON PIORAENSE Van Royen, *Alpine Fl. N. Guin.* 2: 829 & 831--832, fig. 282 G--M. 1979.

Bibliography: Van Royen, *Alpine Fl. N. Guin.* 2: 825, 829, & 831--832, fig. 282 G--M. 1979; Mold., *Phytologia* 50: 254 & 270. 1982.

Illustrations: Van Royen, *Alpine Fl. N. Guin.* 2: 829, fig. 282 G--M. 1979.

This species is based on Henty & Carlquist NGF.16641 from Mt. Piora, Territory of New Guinea, deposited in the Leiden herbarium. Van Royen (1979) lists it also from Mt. Giluwe and Ibawara in Papua, based on Van Royen 11228 and Kalkman 4890. He asserts that the plant inhabits wet spots in alpine grasslands or in open montane recently burned areas with secondary grass, at 2700--3200 m. altitude. It has been collected in anthesis in February, June, and July.

Citations: MOUNTED ILLUSTRATIONS: Van Royen, *Alpine Fl. N. Guin.* 2: 829, fig. 282 G--M. 1979 (Ld).

ERIOCAULON PLUMALE N. E. Br.

Additional bibliography: Mold., *Phytologia* 41: 430, 451, & 454. 1979; Mold., *Phytol. Mem.* 2: 200, 205, 207, 208, 210, 216, 403, & 603. 1980.

ERIOCAULON PLUMALE ssp. **JAEGERI** (Mold.) Meikle

Additional bibliography: Mold., *Phytologia* 41: 451. 1979; Mold., *Phytol. Mem.* 2: 207 & 603. 1980.

ERIOCAULON PLUMALE ssp. **KINDIAE** (H. Lecomte) Meikle

Additional bibliography: Mold., *Phytologia* 41: 451-452. 1979; Mold., *Phytol. Mem.* 2: 207, 208, 216, & 603. 1980.

ERIOCAULON PLUMBEUM Colla

Additional bibliography: Mold., *Phytologia* 24: 492. 1972; Mold., *Phytol. Mem.* 2: 142 & 603. 1980.

ERIOCAULON POILANEI Mold.

Additional bibliography: Mold., *Phytologia* 24: 492. 1972; Mold., *Phytol. Mem.* 2: 292 & 603. 1980.

ERIOCAULON POLUENSE Wang & Tang

Additional bibliography: Mold., *Phytologia* 24: 492. 1972; Mold., *Phytol. Mem.* 2: 278 & 603. 1980.

ERIOCAULON POLYCEPHALUM Hook. f.

Additional bibliography: Mold., *Phytologia* 41: 452. 1979; Mold., *Phytol. Mem.* 2: 262, 285, & 603. 1980.

Material of this species has been misidentified and distributed in some herbaria as E. robusto-brownianum Ruhl. On the other hand, the Saldanha 12725 & 16445, distributed as E. polycephalum, actually are E. robusto-brownianum Ruhl.

Additional citations: INDIA: Karnataka: Saldanha 12327 (W--2797023).

ERIOCAULON PRINGLEI S. Wats.

Additional bibliography: Mold., *Phytologia* 32: 505. 1976; Mold., *Phytol. Mem.* 2: 62 & 603. 1980.

Additional citations: MEXICO: Chihuahua: Pringle 2018 (Mi).

ERIOCAULON PSEUDOCOMPRESSUM Ruhl.

Additional bibliography: Mold., *Phytologia* 36: 487. 1977; Mold., *Phytol. Mem.* 2: 89 & 603. 1980.

ERIOCAULON PSEUDOQUINQUANGULARE Ruhl.

Additional bibliography: Mold., *Phytologia* 24: 493. 1972; Mold., *Phytol. Mem.* 2: 262 & 603. 1980.

ERIOCAULON PUBIGERUM Bong.

Synonymy: Eriocaulon pubigerum Kunth ex Steud., *Syn. Pl. Glum.* 2: [Cyp.] 281. 1855. Paepalanthus pubigerus Kunth ex Steud., *Syn. Pl. Glum.* 2: [Cyp.] 281, in syn. 1855.

Additional & emended bibliography: Steud., *Syn. Pl. Glum.* 2: [Cyp.] 279, 281, & 334. 1855; Mold., *Phytologia* 24: 493. 1972; Mold., *Phytol. Mem.* 2: 142. 1980.

Citations: MOUNTED CLIPPINGS: Bong., *Mem. Acad. Imp. Sci. St.-Petersb.*, ser. 6, 1: 628. 1831 (W); Steud., *Syn. Pl. Glum.* 2: [Cyp.] 281. 1855 (W).

ERIOCAULON PULCHELLUM Körn.

Additional bibliography: Mold., *Phytologia* 41: 452. 1979; Mold., *Phytol. Mem.* 2: 200, 205, 207--209, 401, 403, & 603. 1980.

Adam encountered this species on savannas, in fruit in November.

Additional citations: LIBERIA: Adam 30158 (E--2355171).

ERIOCAULON PULLUM T. Koyama

Additional bibliography: Mold., *Phytologia* 24: 494. 1972; Mold., *Phytol. Mem.* 2: 278 & 603. 1980.

ERIOCAULON PULVINATUM Van Royen

Additional bibliography: Mold., *Phytologia* 24: 292. 1972; Van Royen, *Alpine Fl. N. Guin.* 2: 825--827, fig. 281 G--L. 1979; Mold., *Phytol. Mem.* 2: 326 & 603. 1980.

Additional illustrations: Van Royen, *Alpine Fl. N. Guin.* 2: 827, fig. 281 G--L. 1979.

Brass asserts that this plant is endemic to alpine bogs and open sunny ponds in alpine grasslands, at 3225--3560 m. altitude, in West Irian, both flowering and fruiting in September. Stevens & Veldkamp refer to it as an herb forming small clumps, the leaves "mid-green" and the inflorescences brownish and have encountered it at 2560 m. altitude, in both flower and fruit in May.

Additional citations: NEW GUINEA: West Irian: Stevens & Veldkamp LAE.54929 (E--2356481). MOUNTED ILLUSTRATIONS: Van Royen, *Alpine Fl. N. Guin.* 2: 827, fig. 281 G--L. 1979 (Ld).

ERIOCAULON PUMILIO Hook. f.

Additional bibliography: Fyson, *Indian Sp. Erioc.* pl. 7. 1923; Worsdell, *Ind. Lond. Suppl.* 1: 376. 1941; Mold., *Phytologia* 29: 220. 1974; Mold., *Phytol. Mem.* 2: 256, 262, & 603. 1980.

Additional illustrations: Fyson, *Indian Sp. Erioc.* pl. 7. 1923.

ERIOCAULON PUSILLUM R. Br.

Additional bibliography: Mold., *Phytologia* 24: 494 (1972) and 37: 263 & 264. 1977; Mold., *Phytol. Mem.* 2: 336 & 603. 1980.

ERIOCAULON PYGMÆUM Soland. ex J. E. Sm. in Rees, *Cycl.* 13: *Eriocaulon*. 1809 [not E. pygmæum Dalz., 1851, nor Körn., 1863., nor Mart., 1841].

Additional synonymy: Eriocaulon pygmæum "Soland. ex Smith", in herb.

Additional bibliography: Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 706, 711, & 964, fig. 480 (2). 1911; C. A. Gardn., *Enum. Pl. Austral. Occid.* 1: 17. 1930; Mold., *Phytologia* 34: 487. 1976; Mold., *Phytol. Mem.* 2: 336 & 603. 1980.

Additional illustrations: Lotsy, *Vortr. Bot. Stammesges.* 3 (1): 706, fig. 480 (2). 1911.

Recent collectors describe this plant as a low perennial herb with white flower-heads and have found it growing in small patches of otherwise bare soil among grassy vegetation on waterlogged ground and "common in shallow black soil in seepage areas", at 200 m. altitude, both in flower and fruit in February and June.

Additional citations: AUSTRALIA: Northern Territory: Kanis 1826 (Ld, W--2939250); Lazarides 7897 (W--2916602).

[to be continued]

A REPORT ON THE OCCURRENCE OF ZEYLANIDIUM LICHENOIDES
IN THE STATE OF TAMIL NADU, INDIA

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Dept. of Botany, The National College, Bangalore 560004, India

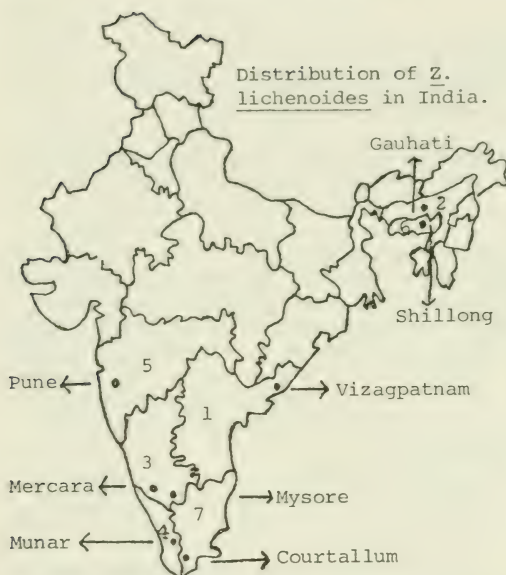
According to Nagendran, C. R. et al. (1976-77), the family Podostemaceae is represented in India by 20 species. The taxon, Zeylanidium lichenoides (Kurz) Engl., was reported from the following states: Andhra Pradesh (Vizagapatnam), Assam** (62nd mile post on road from Shillong to Gauhati), Karnataka (Cauvery falls in Chunchunkatte, Mysore Dist., and Jodapala, 18 kms from Mercara-Mangalore road, Coorg Dist.), Kerala (waterfalls in Munar, Idikki Dist.) and Maharashtra (21 kms west of Junnar, Inglnun Bhivadi road, Pune Dist.).

The present paper accounts for the occurrence of Zeylanidium lichenoides in Tamil Nadu. This species was found growing on partially submerged rocks in a stream located between Shenbaghadevi falls and Honey falls, Courtallum, South-west Tamil Nadu. The collection spot lies about 60 miles east of the Kerala State border. Several collections of the specimen were made by the following: K. N. Gandhi and J. V. Rudramuny (Oct. 1975), K. N. Gandhi and Narayanan Mohan (Oct. 1977 & Oct. 1978), K. N. Gandhi and M. Seenappa (Oct. 1979), and J. V. Rudramuny and B. K. Sadashiva Singh (Oct. 1980). All the above collections were in the vegetative state only, and it was not possible to identify the specimen (polymorphism is common in this family). However, flowering and fruiting specimens were collected by K. N. Gandhi and Y. Thulajappa (June, 1981) and identified as Z. lichenoides. Further collections were made by K. N. Gandhi and H. Gokul (Nov. 1981) and Y. Thulajappa and Narayanan Mohan (Nov. 1982). The specimens are deposited in the Dept. of Botany, National College and N.L.U.

P. Van Royan (1951-54) has described variations found in the habitat of Podostemaceae including the growth of the specimens on woody stems and roots that are permanently wet with stream water. The authors also collected specimens of Z. lichenoides in this habitat and as epiphytes on the buttresses (of a Ficus tree) that were under constant spray of water from a small waterfall, in the same area.

* Current address: The Herbarium, N.L.U.

** Whether the collection spot presently is in the State of Meghalaya (separated from Assam) or in the present Assam, is not clear to the authors.



- 1) Andhra Pradesh, 2) Assam, 3) Karnataka, 4) Kerala, 5) Maharashtra, 6) Meghalaya and, 7) Tamil Nadu



Growth of Z. lichenoides as an epiphyte on the buttresses of a Ficus tree.

The authors are thankful to the following: Prof. S. Desikachar (Principal) and Dr. G. R. Kantha Raj (Head, Botany) of National College for the use of facilities; Dr. C. R. Nagendran, Post-Graduate Dept. of Botany, University of Mysore, 570006, India for confirming the identification of the specimen; Dr. R. Dale Thomas, Director, The Herbarium, Northeast Louisiana University, Monroe, LA 71209, U.S.A., for improving this manuscript.

References:

Nagendran, C. R. et al. 1976-77. Distribution of Podostemaceae in India. J. Mysore Univ. Sect. B. 27: 172-188.

Von Royan, P., 1951-54. The Podostemaceae of the New World I, II and III. Meded. Bot. Mus. and Herb. Utrecht.

STARCH GRAINS OF THE WILD AND CULTIVATED
MEXICAN SPECIES OF SOLANUM, SUBSECTION POTATOE

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This study was undertaken in order to ascertain the usefulness of starch grains in separating the species of the Section Petota of the genus Solanum L. Through microscopic examination of the grains, it was hoped that the identification of fragmentary tuber remains from herbarium specimens and archeological collections might be facilitated, as well as the determination of fresh tubers from potato germ plasm collections.

MATERIALS AND METHODS

Nineteen Mexican species of Solanum, Section Petota were available for study. All were obtained from the Potato Introduction Station, Sturgeon Bay, Wisconsin, where they were grown under uniform environmental conditions.

The tuber grains were examined using phase contrast in both light and dark fields and in conjunction with polarized light (see Verdun, 1982). Two polarizing filters were used, one on either side of the specimen. The amount of polarization was controlled by turning one of the filters until the desired amount of polarization was obtained. Micrographs were made using a Carl Zeiss Standard RA 34 microscope and Eastman Kodak Plus-X film. The prints were made on Kodak Polycontrast II RC paper.

A small piece of each tuber was placed on a microscope slide. The sample was macerated on the slide with a probe handle until it had achieved a watery consistency. Then a drop of water was placed on the slide, followed by the coverslip. Due to the type of lighting used, no stain was required.

Starch grains were examined under medium power (250x). For each preparation, the frequency and shape (Figs. 1 and 2) of the 5 largest starch grains were noted and their size measured with the aid of an ocular micrometer.

RESULTS AND DISCUSSION

In the Mexican species, five distinct starch groups based upon length, an overall width/length ratio, and a hilum length ratio are revealed in the scatter diagram plots (Figs. 3 and 4). These display little or no correlation with previously described series.

Species from South America were also examined using the above mentioned characters and will be reported upon in a later paper. Five distinct groups of Mexican species, based upon the variation in their starch grains, were observed. Solanum tuberosum, the cultivated species, is native to South America but has been included in these Mexican studies for comparative purposes.

The great wealth of morphological variation expressed in the growth form of wild potato species is reflected in the appearance of the starch grains. In the present study, this variation leads to a series of species with similarly sized and shaped starch grains.

Within our groups, further clusters can be observed (Fig. 4). Grain length is the primary basis by which the groups are distinguished from one another, although the width/length ratio is also important in the separation of the grains into subclusters.

In the starch group Bulbocastana, Solanum stoloniferum and S. jamesii form one subcluster, while S. polyadenium, S. brachistotrichum, S. polytrichon, S. bulbocastanum and S. trifidum form another (Fig. 4). Other clustering effects may be observed in the starch group Papita, this encompassing 2 groups. One cluster consists of 3 species, S. demissum, S. papita and S. morelliforme. All have rather similar starch, but these may be distinguished from one another by slight differences in grain length and by the grain width/length ratio. The other two members of this group, S. verrucosum and S. stenophyllidium, while more distantly related from the other 3, all of which have narrower grains, are distinguished from one another primarily by starch grain length.

The remaining starch groups from Mexico, Clara, Pinnatesecta and Guerreroensa, have starch grains of different length. These groupings contain no subclusters within them.

The starch grains of the 19 species examined were predominantly Type A (Fig. 1), but each species presented variations of this class. Thus the starch of each species appears to be unique and readily distinguishable. This enables identification of an unknown plant, even when flowering material is not available.

The utilization of starch grains as a taxonomic feature in the genus Solanum is particularly useful to the archaeologist, as noted by Ugent et. al., 1982. With the aid of the taxonomic keys provided in the present study the worker may place an unknown species of Solanum into a designated starch group. From there it is possible to identify it to species, using the descriptions provided here.

KEY to the MEXICAN STARCH GROUPS*

1. Starch grains less than 48 microns long.....I. Bulbocastana
1. Starch grains greater than 48 microns long.....2
 2. Grains less than 52 microns long.....II. Papita
 2. Grains greater than 52 microns long.....3
 3. Grains less than 62 microns long.....III. Clara
 3. Grains greater than 62 microns long.....4
 4. Grains less than 66 microns long.....
 -IV. Pinnatisceta
 4. Grains greater than 66 microns long.....
 -V. Guerreroensa

STARCH GROUP I BULBOCASTANA.

Grains ovoid or shell shaped; 32 to 52 microns long, averaging 40 microns; 16 to 36 microns wide, with a mean of 24 microns; hilum 4 to 12 microns from proximal end, averaging 8 microns. Eightyseven percent consists of Type A (Figs. 1 and 2), with the remainder being types B, D, F, G, H, I, J, or K.

1. SOLANUM STOLONIFERUM Schlechtd. et Bche. (Figs. 5, 6).

Grains ovoid; 32 to 44 microns in length, averaging 37 microns; varying 16 to 35 microns in width, with a mean of 21 microns; hilum located 4 to 8 microns from proximal end of grain, with a mean of 7.8 microns. Eightyfive percent consists of Type A (Figs. 1 and 2), with the remainder being types D, F, or I.

2. SOLANUM JAMESII Torr. (Figs. 7, 8).

Grains globose; 36 to 40 microns in length, averaging 38 microns; varying 20 to 35 microns in width, with a mean of 23 microns; hilum located 8 microns from proximal end of grain. Ninety percent consists of Type A (Figs. 1 and 2), with the remainder being Types D, F, or J.

3. SOLANUM TRIFIDUM Schlechtd. (Figs. 9, 10).

Grains ellipsoid; 36 to 44 microns in length, averaging 40 microns; varying 24 to 32 microns in width, with a mean of 26 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 9 microns. Ninetyfive percent consists of Type A (Fig. 1), with the remainder being Type D.

4. SOLANUM POLYADENIUM Greenm. (Figs. 11, 12).

Grains narrowly to broadly ovoid; 36 to 44 microns in length, averaging 40 microns; varying 16 to 24 microns in width, with a mean of 20 microns; hilum located 4 to 8 microns from proximal end of grain, with a mean of 6 microns. All consist of Type A (Fig. 1).

5. SOLANUM BRACHISTOTRICHUM (Bitt.) Rydb. (Figs. 13, 14).

Grains ovoid; 32 to 52 microns in length, averaging 40 microns; varying 16 to 28 microns in width, with a mean of 20 microns; hilum located 4 to 12 microns from proximal end of grain, with a mean of 7 microns. Eightythree percent consists of Type A (Figs. 1 and 2),

*Based on an average of the five largest starch grains per preparation.

with the remainder being Types D, F, G, or I.

6. *SOLANUM BULBOCASTANUM* Dun. (Figs. 15, 16).

Grains ellipsoid-ovoid; 36 to 48 microns in length, averaging 40 microns; varying 20 to 28 microns in width, with a mean of 25 microns; hilum located 4 to 12 microns from proximal end of grain, with a mean of 8 microns. Eightysix percent consists of Type A (Figs. 1 and 2), with the remainder being Types G, H, or K.

7. *SOLANUM POLYTRICHON* Rydb, (Figs. 17, 18).

Grains shell-like to ellipsoid, varying to ovoid, or with sharp angular sides; 40 to 44 microns in length, averaging 42 microns; varying 20 to 24 microns in width, with a mean of 23 microns; hilum located 4 to 8 microns from proximal end of grain, with a mean of 6 microns. Seventythree percent consists of Type A (Figs. 1 and 2), with the remainder being Types B, F, or G.

8. *SOLANUM CARDIOPHYLLUM* Lindl. (Figs. 19, 20).

Grains ovoid to globose; 36 to 48 microns in length, averaging 42 microns; varying 16 to 36 microns in width, with a mean of 28 microns; hilum located 8 microns from proximal end of grain. Ninety percent consists of Type A (Figs. 1 and 2), with the remainder being Type F or G.

9. *SOLANUM FENDLERI* A. Gray (Figs. 21, 22).

Grains ellipsoid-ovoid; 40 to 52 microns in length, averaging 44 microns; varying 28 to 36 microns in width, with a mean of 32 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 10 microns. Ninetyone percent consists of Type A (Figs. 1 and 2), with the remainder being Type F or K.

STARCH GROUP II PAPITA.

Grains ellipsoid to ovoid; 36 to 60 microns long, averaging 51 microns; 12 to 36 microns wide, with a mean of 26 microns; hilum 4 to 20 microns from proximal end averaging 9 microns. Ninetytwo percent consists of Type A (Figs. 1 and 2), with the remainder being Types C, D, F, or G.

10. *SOLANUM DEMISSUM* Lindl. (Figs. 23, 24).

Grains very narrowly ellipsoid; 44 to 60 microns in length, averaging 50 microns; varying 16 to 32 microns in width, with a mean of 22 microns; hilum located 8 microns from proximal end of grain. Ninetysix percent consists of Type A (Figs. 1 and 2), with the remainder being Type D or G.

11. *SOLANUM PAPITA* Rydb. (Figs. 25, 26).

Grains ellipsoid-ovoid, or irregular; 44 to 60 microns in length, averaging 50 microns; varying 16 to 32 microns in width, with a mean of 23 microns; hilum located 4 to 8 microns from proximal end of grain, with a mean of 7 microns. Ninety percent consists of Type A (Figs. 1 and 2), with the remainder being Type F or G.

12. *SOLANUM MORELLIFORME* Bitt. et Muench (Figs. 27, 28).

Grains very narrowly ellipsoid, tending to be irregular or angular; 36 to 50 microns in length, averaging 51 microns; varying 12 to 36 microns in width, with a mean of 24 microns; hilum located 4 to 12 microns from proximal end of grain, with a mean of 7 microns.

Ninety percent consists of Type A (Figs. 1 and 2), with the remainder being Types C, D, F, or G.

13. *SOLANUM VERRUCOSUM* Schlechtd. (Figs. 29, 30).

Grains ovoid, or slightly irregular; 48 to 52 microns in length, averaging 50 microns; varying 28 to 32 microns in width, with a mean of 29 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 11 microns. Eightynine percent consists of Type A (Figs. 1 and 2), with the remainder being Types C, F, or G.

14. *SOLANUM STENOPHYLLIDUM* Bitt. (Figs. 31, 32).

Grains ovoid; 48 to 52 microns in length, averaging 52 microns; varying 24 to 36 microns in width, with a mean of 31 microns; hilum located 8 to 20 microns from proximal end of grain, with a mean of 14 microns. Eightynine percent consists of Type A (Figs. 1 and 2), with the remainder being Types F, D, or G.

STARCH GROUP III CLARA.

Grains ovoid to ellipsoid; 42 to 68 microns long, averaging 59 microns; 28 to 44 microns wide, with a mean of 36 microns; hilum 8 to 12 microns from proximal end, averaging 10 microns. Seventyfour percent consists of Type A (Figs. 1 and 2), with the remainder being Types F, G, K, or H.

15. *SOLANUM CLARUM* Corr. (Figs. 33, 34).

Grains narrowly ovoid; 42 to 64 microns in length, averaging 58 microns; varying 28 to 40 microns in width, with a mean of 34 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 10 microns. Ninetythree percent consists of Type A (Figs. 1 and 2), with the remainder being Type F or G.

16. *SOLANUM BRACHYCARPUM* Corr. (Figs. 35, 36).

Grains irregularly ovoid to globose; 48 to 68 microns in length, averaging 60 microns; varying 32 to 44 microns in width, with a mean of 39 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 10 microns. Eightythree percent consists of Type A (Figs. 1 and 2), with the remainder being Types F, G, H, or K.

STARCH GROUP IV PINNATISCETA.

Grains ovoid; 48 to 76 microns long, averaging 64 microns; 32 to 40 microns wide, with a mean of 34 microns; hilum 8 to 12 microns from proximal end of grain, with a mean of 10 microns. Eighty two percent consist of Type A (Figs. 1 and 2), with the remainder being Types B, D, F, G, H, or I.

17. *SOLANUM TUBEROSUM* L. (Figs. 37, 38).

Grains broadly ovoid; 48 to 76 microns in length, averaging 64 microns; varying 32 to 36 microns in width, with a mean of 33 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 10 microns. Eightytwo percent consists of Type A (Figs. 1 and 2), with the remainder being Types D, F, or G.

18. *SOLANUM PINNATISECTUM* Dun. (Figs. 39, 40).

Grains very large, ellipsoid; 60 to 72 microns in length, averaging 65 microns; varying 32 to 40 microns in width, with a mean of 36 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 10 microns. Eightyfour percent consists of Type A (Figs. 1 and 2), with the remainder being Types B, D, F, G, H, or I.

STARCH GROUP V GUERREROENSA.

Grains companulate; 56 to 76 microns long, averaging 69 microns; 28 to 68 microns wide, with a mean of 51 microns; hilum 8 to 12 microns from proximal end, averaging 11 microns. Eightyeight percent consists of Type A (Figs. 1 and 2), with the remainder being Type F.

19. *SOLANUM GUERREROENSE* Corr. (Figs. 41, 42).

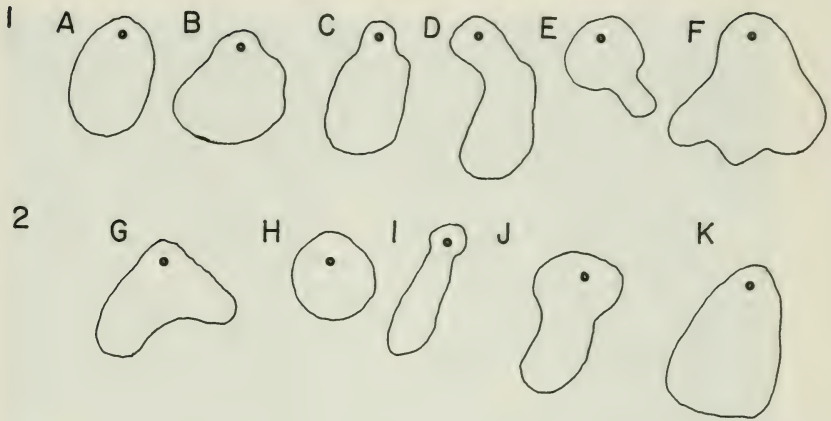
Grains narrowly irregular to broadly campanulate; 56 to 76 microns in length, averaging 69 microns varying 28 to 68 microns in width, with a mean of 51 microns; hilum located 8 to 12 microns from proximal end of grain, with a mean of 11 microns. Eightyeight percent consists of Type A (Figs. 1 and 2), with the remainder being Type F.

ACKNOWLEDGEMENT

Thanks are due to Mr. Roman Ross of the Potato Introduction Station, Sturgeon Bay, Wisconsin, for sending us the tuber materials used in this study.

LITERATURE CITED

- Correll, D.S. 1962. The Potato and It's Wild Relatives. Texas Research Foundation, Renner, Texas. 606 pp.
- Hawkes, J.G. 1963. A Revision of the Tuber-Bearing *Solanums*. Rec. Scott. Pl. Breed. Stn. 76-181.
- Ugent, D., S. Pozorski and T. Pozorski. 1982. Archaeological potato tuber remains from the Casma Valley of Peru. Economic Botany, 36:182-192.
- Verdun, M.P. 1982. Starch Grains: A Taxonomic Character in *Solanum* (Tourn) L. Section Tuberarium. Unpublished Masters Thesis. Southern Illinois University, Carbondale. 47 pp.



Figs. 1 and 2. Variation in Solanum starch grains.

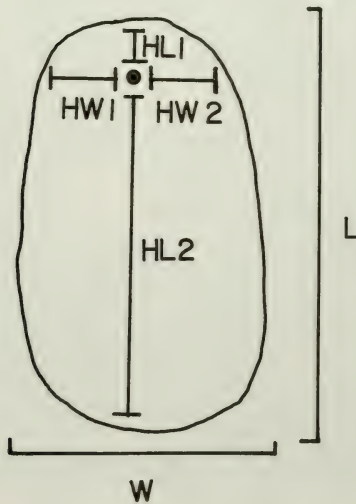


Fig. 3. Starch grain measurements taken in this study; width (W); length (L); length from the hilum to the proximal edge (HL_1); length from the hilum to the farthest edge (HL_2); length from the hilum to the closest lateral edge (HW_1); and the length from the hilum to the farthest lateral edge (HW_2).

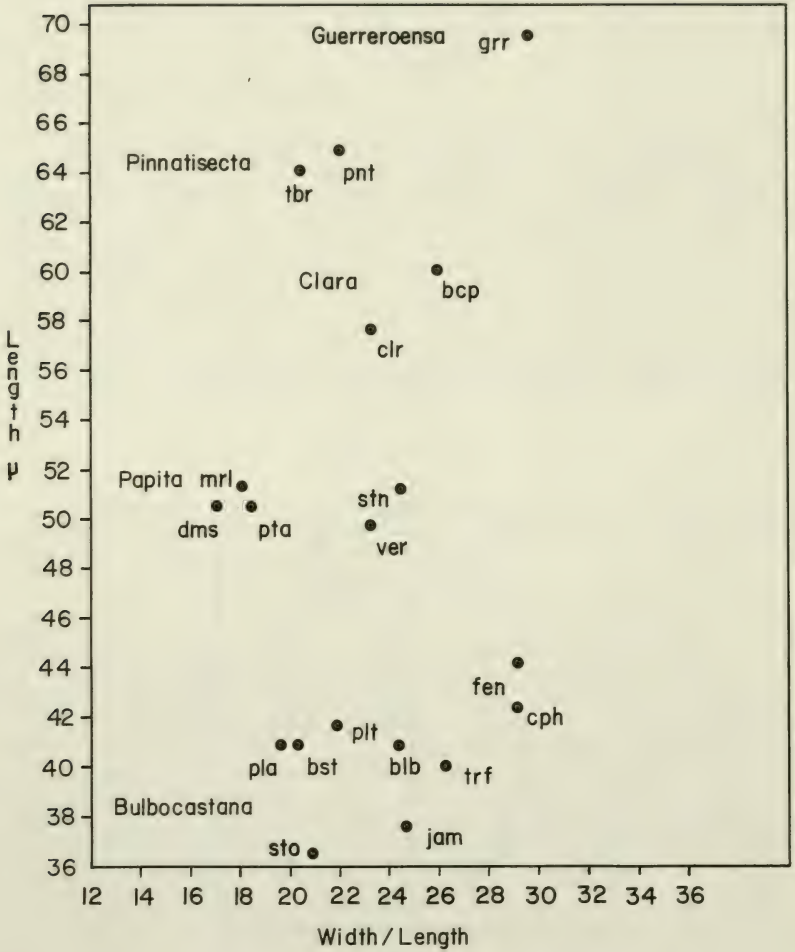
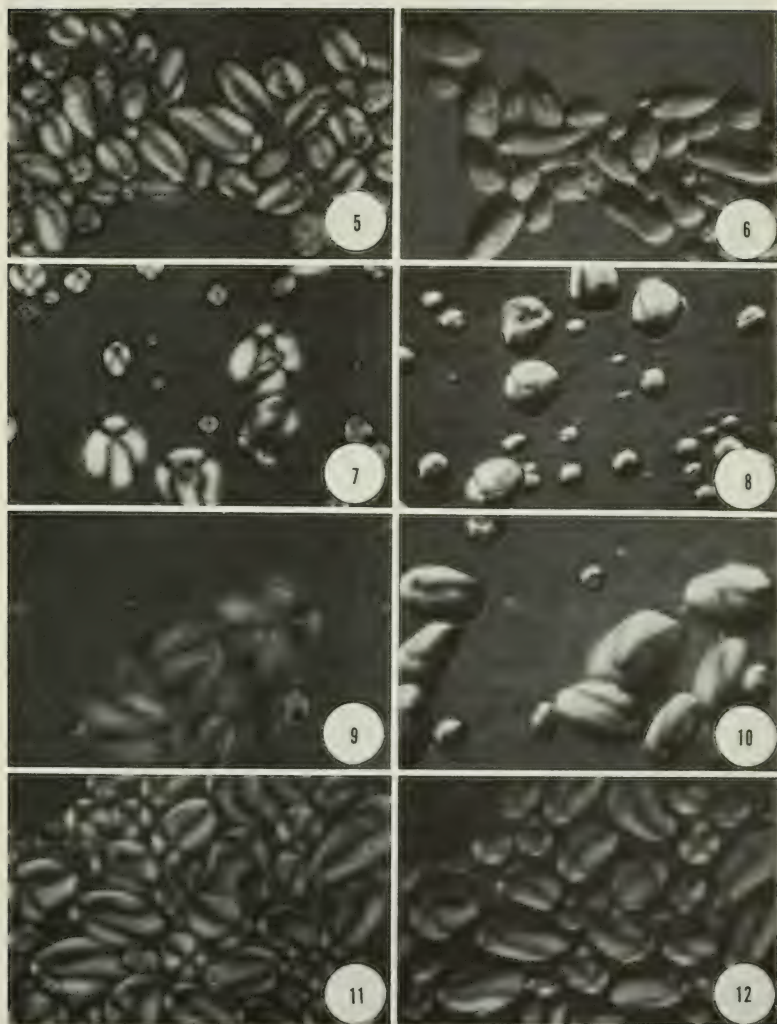
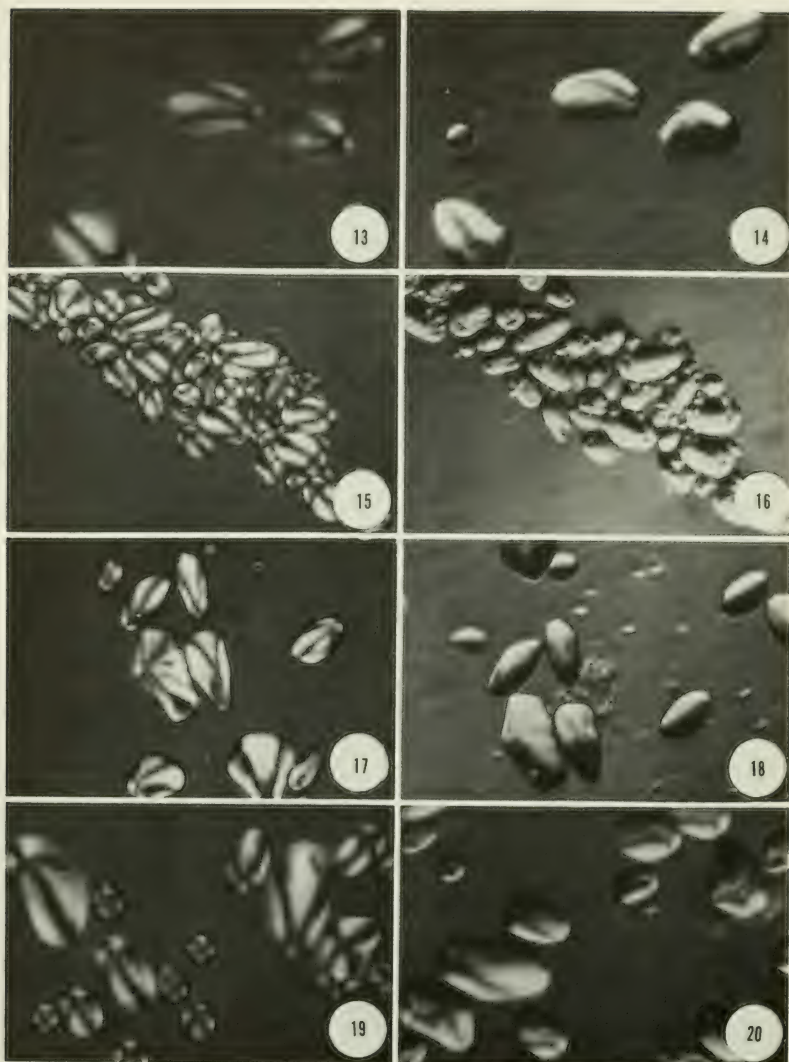


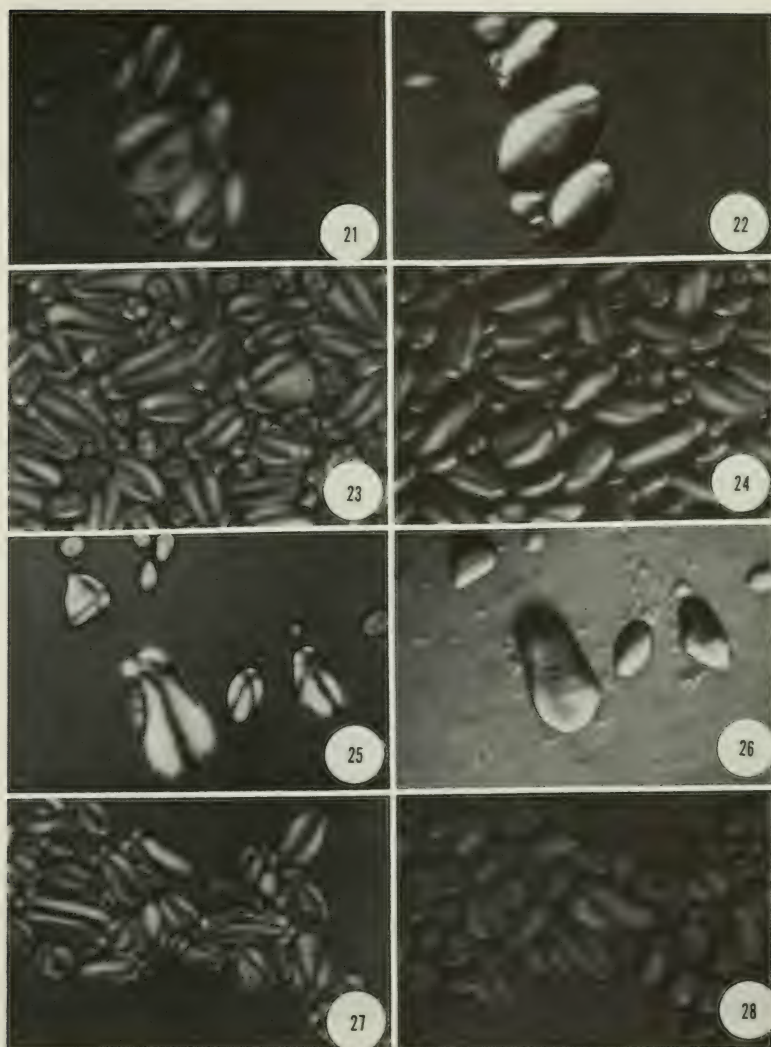
Fig. 4. Starch types in *Solanum*, Sect. Petota, Subsection Potatoe.



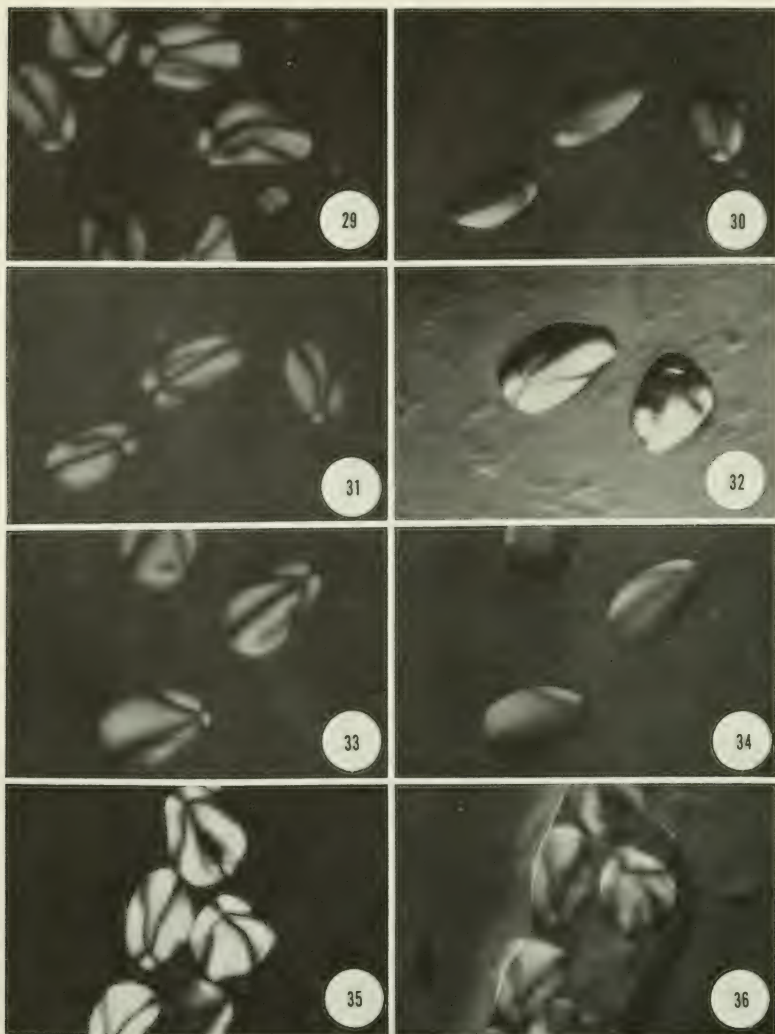
Figs. 5-12. Solanum starch (250x) photographed with polarized light (light field, left column; dark field, right column): 5-6. S. stoloniferum; 7-8. S. jamesii; 9-10. S. trifidum; and 11-12. S. polyadenium.



Figs. 13-20. Solanum starch (250x) photographed with polarized light (light field, left column; dark field, right column): 13-14. S. brachistotrichum; 15-16. S. bulbocastanum; 17-18. S. polytrichon; 19-20. S. cardiophyllum.



Figs. 21-28. Solanum starch (250x) photographed with polarized light (light field, left column; dark field, right column): 21-22. S. fendleri 23-24. S. demissum; 25-26. S. papita; and 27-28. S. morelliforme.



Figs. 29-36. *Solanum* starch (250x) photographed with polarized light (light field, left column; dark field, right column): 29-30. *S. verrucosum*; 31-32. *S. stenophyllidum*; 33-34. *S. clarum* and 35-36. *S. brachycarpum*.



Figs. 37-42. Solanum starch (250x) photographed with polarized light (light field, left column; dark field, right column): 37-38. S. tuberosum; 39-40. S. pinnatisectum; and 41-42. S. guerreroensis.

NOTES ON NEARCTIC HEPATICAE, XVI. New Taxa
of Frullania from Eastern North America

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From 1949-1961 I published a series of papers with the above title. Nos. I-XV were published from 1949-1957, and nos. XVIII and XIX appeared within a few months of each other in 1961. No. XVI is here published and XVII will soon appear. These two "missing" papers have existed in manuscript since about 1959 and were not issued earlier because I felt that the taxonomic conclusions were based on an "uncomfortably" small sample. As the following will make clear, that element of discomfort has not been removed in the case of the four new entities here described in Frullania. I would prefer to leave these taxa rest in the limbo to which I assigned them for over two decades -- they, after all, do no harm there. However, preparation of the text on Frullania for the last volume of The Hepaticae and Anthocerotae of Eastern North America is now at the point where I have no alternative out to treat these taxa.

My reservations about the wisdom of publishing these derive from two sources: (1) the fourth taxon described, F. appalachiana, although clearly distinct, belongs to a complex so involved and impenetrable that I hesitate to add another species to it; I have even toyed with the idea that the plant is a "paleohybrid." (2) Two taxa described as new species are known only from single stations; one of these stations is now apparently destroyed. Considering the rate of environmental destruction in southern Florida, from where these taxa come, it may seem futile to describe them -- since there is no guarantee they can be recollected. However, as the southern Florida flora is a derivative lowland flora, these taxa should also occur in the Antilles. Unfortunately, habitat destruction, especially of lowland floras, is even more pervasive in the Antilles than in Florida! In Florida there is, indeed, a good chance that the sole station for Frullania taxodiocola may soon become a monoculture dominated by Melaleuca leucadendra introduced by the USDA -- an example of incompetence on the part of that agency that leaves the biologist almost speechless.

The four taxa are thus described from plants collected in the 1940's and 1950's, described prior to 1959 for the Columbia Univ. Press text, and not recollected since the 1950's except for F. sabaliana, which I found again in 1983. F. appalachiana, fortunately, is in no danger of extinction since it seems frequent at high elevations in the Appalachians.

1. Frullania (Diastaloba) taxodiocola Schust., sp. n.

Species F. obcoradatae-F. gymnoti affinis, ab ambobus differens

ut (1) dioecia, (2) minima, 500-750 μ m latitudine in cauliculis principalibus, et (3) rhizoidea e marginibus folii efficit.

Type. On bark of Taxodium ascendens, in Cypress Head, just N. of Tamiami Canal, between Monroe Station and Ochopee, Monroe Co., Florida (RMS 42241, Dec. 25, 1958; FM).

F. taxodiocola is known only from the type which bears (on separate patches) σ and ϕ plants (no fertilized gynoeceia have been seen), and a small second collection (RMS 42240) of sterile plants.

The small size suggests F. kunzei and F. donnellii, but it differs from these in criteria 1 and 3, above, plus in the oblique lobules, with orientation as in F. gymnotis and F. obcordata. F. gymnotis is a larger plant, 1-1.5 mm wide, which does not have incised lobules (in F. taxodiocola they are incised on the free outer margins to half the lobule length); it also lacks any evidence of asexual propagation (in F. taxodiocola scattered marginal cells are deeply pigmented, and are potentially rhizoid-developing; they presumably are associated with tardily and sporadically caducous leaves). The toothed bracts, small size, and the rhizoid-developing caducous leaves all easily separate the species from F. obcordata.

2. Frullania (Trachycolea) sabaliana Schust., sp. n.

Species F. inflatae cognata ut (a) inflorentiae autoeciae; (b) amphigastria basim versus cuneatim angustata; trigona parva ad parum nodosa, incrassationibus mediis nullis. A F. inflata distincta ut (a) perianthium ad apicem in os fere erostratum angustatum; (b) plantae maturae e substrato discretae atque valde arcuatae; (c) plantae vigentes, 1.5-1.8 mm latitudine.

Type. On "knees" of Taxodium distichum, along Hillsborough R., Hillsborough River State Park, Florida (RMS 83-1003). The collection made in January 1983 is regarded as type, since the plants are more copious than those collected many years earlier at the same locality (RMS 33903, 33910a).

Found both on "knees" of T. distichum and (rarely) on trunks of Sabal palmetto. For a quarter of a century the species has been allowed to rest in limbo, since no other stations for it have come to light. In 1983 an especial effort was made to collect it at several levels above the Hillsborough R. Even though the common phases are found on Taxodium knees which are subject to periodic submersion, some collections, both from Sabal and from Taxodium bases, occur well above the zone of periodic submersion. Such plants are fulvous to slightly copper-colored; like the phenotypes along river margins, they lack inflated lobules of stem leaves. The unique perianth form and vigorous size both deviate from "normal" F. inflata, to which I once assigned it (in MS) as a subspecies. Hours were spent in 1983 trying to find "normal" F. inflata at the type locality of F. sabaliana -- without success [F. inflata is rare and local in Florida as a whole, and the

nearest stations for it I know are in O'Leno State Park and Highlands Hammock State Park, both in Florida]. In all cases, the F. inflata grows closely creeping and only the tips of perianth-bearing branches are a little elevated above the substrate. By contrast, the much larger F. sabaliana has a clear differentiation between creeping primary (sterile) axes and strongly spreading ultimate (sterile and fertile) branches -- lending that species a very different aspect. Both growth habit and size give it some similarity to young phases of Porella pinnata, which may occur admixed.

3. Frullania (Trachycolea) inflata var. styliifera Schust., var. n.

Varietas F. inflatae typicae similis nisi quod: (a) stylus conspicuus, ad basim 4-9 cellulis latus; et (b) guttae olei (5-8)10-16 in unaquaque cellula media.

Type. Whitewater River State Park, Minnesota (MS 14205). Also known from two other collections from the same area (MS14213, 14206).

Differing from "ordinary" F. inflata in the two above criteria and in the rather large underleaves, 2-3X as wide as the stem, 3-4-dentate to lobulate distally. In the last criterion similar to F. inflata ssp. illyrica (Grolle) Schust., comb. n. [Basionym: F. illyrica Grolle in Meyer & Grolle, Fedd. Repert. 68:101, 1963] but the latter has 2-3, rarely 4, oil-bodies per cell and these are relatively large (ca. 7 x 7-10 μ). In the large oil-bodies subsp. illyrica approaches F. sabaliana, but the latter has mostly 3-5 oil-bodies per cell, each to 4-5.5 x 7.5-10 μ in size.

4. Frullania (Trachycolea) appalachiana Schust., sp. n.

Species F. eboracensis pro parte maxima similis (amphigastriis ad basim cuneatis, unum dentem infirmum, ut plurimum utrimque habentibus; folis caducis copiose evolutis; cellulis trigona sinuosa grossa atque incrassationes medias habentibus), distincta, autem, ut (a) perianthium 3-5 carinas atque superficies interiacentes multum conspicue tuberculatas atque manifeste incrassatas habet; atque (b) lobuli cauliculorum principalium subquadrati, ore inaperto, magni (0.5-0.75 partes area lobulorum subiacentium celantes).

Type. Grandfather Mt., Avery Co., North Carolina (MS 44601). Known from several other collections from the Southern Appalachians at 5000-6250 feet, in the Fraser Fir zone.

The species appears to be most closely allied to the common European-Macaronesian F. dilatata, which differs as follows: (a) asexual reproduction by caducous leaves lacking; (b) tubercles of the perianth surface caducous and allowing asexual propagation in this fashion.

NOTES ON NEW AND NOTEWORTHY PLANTS. CLXVII

Harold N. Moldenke

CITHAREXYLUM MYRIANTHUM var. *BAHIENSE* Mold., var. nov.

Haec varietas a forma typica speciei foliis regulariter multo parvioribus petiolis 2--6 mm. longis laminis 3--7 cm. longis 1.5--3 cm. latis apicaliter rotundato-obtusis basaliter cuneatis recedit.

This variety differs from the typical form of the species in its leaves being regularly much smaller (even on fruiting specimens), the petioles only 2--6 mm. long and the leaf-blades only 3--7 cm. long, 1.5--3 cm. wide, apically rounded and basally cuneate.

The variety is based on Irwin, Harley, & Smith 32458 from a low woodland on sand at the base of Morro do Chapau about 6 km. south of the town of the same name, at an elevation of about 1100 m., in the Serra do Tombador, Bahia, on the Planalto of Brazil, collected on February 18, 1971, and deposited in the Lundell Herbarium at the University of Texas. The collectors note that the plant is a shrub, 1.5 m. tall, and the fruiting-calyx olive in color, the fruit itself green, spotted with white, at the time of collection; the collection being in fruit, it is possible that when flowers are available they may show other and more important differences.

PAEPALANTHUS MACROPODUS var. *GLABER* (Mold.) Mold., comb. nov.

Paepalanthus longicaulis var. *glaber* Mold., *Phytologia* 9: 266. 1963.

SYNGONANTHUS CAULESCENS var. *GARDNERIANUS* Mold., var. nov.

Haec varietas a forma typica speciei foliis numerosissimis densis distincte graminaceis 2--4 cm. longis 2 mm. latis apicaliter argute acutis recedit.

This variety differs from the typical form of the species in the cauline leaves being very numerous and very densely congested, spreading-ascending, distinctly grass-like, 2--4 cm. long, about 2 mm. wide over most of their length, apically abruptly and sharply acute.

The variety is based on George Gardner 5253 from moist places in the Diamantina region of Minas Gerais, Brazil, deposited in the Britton Herbarium at the New York Botanical Garden.

SYNGONANTHUS CAULESCENS var. *HIRSUTUS* Mold., var. nov.

Haec varietas a forma typica speciei vaginis densiuscula hirsutulis recedit.

This variety differs from the typical form of the species in having its peduncle-sheaths rather densely spreading-hirsutulous and the cauline leaves distinctly acute at the apex.

The variety is based on Maguire, Wurdack, and Bunting 35909 from morichal and lakes at the southwest face of Cerro Altamira 10 km. east of Ciudad Piar, at 300 m. altitude, Bolívar, Venezuela, col-

lected on October 21, 1953, and deposited in the United States National Herbarium at Washington. The collectors note that the plant was frequent in the type locality, the "flowers" white.

SYNGONANTHUS LAGOPODIOIDES f. *MINOR* Mold., f. nov.

Haec forma a forma typica speciei statura parviora foliis plerumque brevioribus 1--2.5 cm. longis 1--1.5 mm. latis recedit.

This form differs from the typical form of the species in its usually smaller stature and its basal leaves mostly averaging shorter, 1--2.5 cm. long and 1--1.5 mm. wide, often quite short and almost filiform on mature flowering and/or fruiting plants.

The form is based on Alma L. Moldenke and Harold N. Moldenke 19917 from marshy soil at the edge of a lake in the savannas near Laguna de Santa Maria, Pinar del Rio, Cuba, collected on November 29, 1948, and deposited in the Lundell Herbarium at the University of Texas.

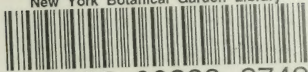
BOOK REVIEW

Alma L. Moldenke

"FERNS AND ALLIED PLANTS With Special Reference To Tropical America" by Rolla M. Tryon & Alice F. Tryon, xii & 857 pp., ca. 175 plant, 175 plant parts, 250 habitat, & 850 spore b/w photos, ca. 135 distribution maps & ca. 70 line draw. & fig. Springer-Verlag, Heidelberg, Berlin & New York, N. Y. 10010. 1982. \$148.00.

This is the first systematic and encyclopedic presentation of recent data and the authors' own research since Bower's famous treatment of well over half a century ago. With neither extreme of lumping or splitting, "the classification of the pteridophytes adopted here comprises about 9,000 species, 240 genera and 33 families" and tends to be based "on character similarities rather than on presumed phyletic relationships" for lack of sufficient information to date. There are about 3,000 species in Tropical America with 40 percent endemism mainly in these four regions: (1) Greater Antillean, (2) Southern Mexico and Central America, (3) Andean and (4) Southeastern Brazil. The introduction lists the classification and chromosome numbers, surveys the biogeography, spore structure and cytology, and cites literature. The many following chapters discuss the individual plants for their taxonomy, their descriptions augmented by excellent photographs mainly by Walter H. Hodge individually and in their natural habitats or with line drawings or shadow prints, their ecology, their geography, their cytology, their spores with exquisitely clear SEM photographs, their chemistry and finally their literature. This book will prove to be of great botanical value.

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